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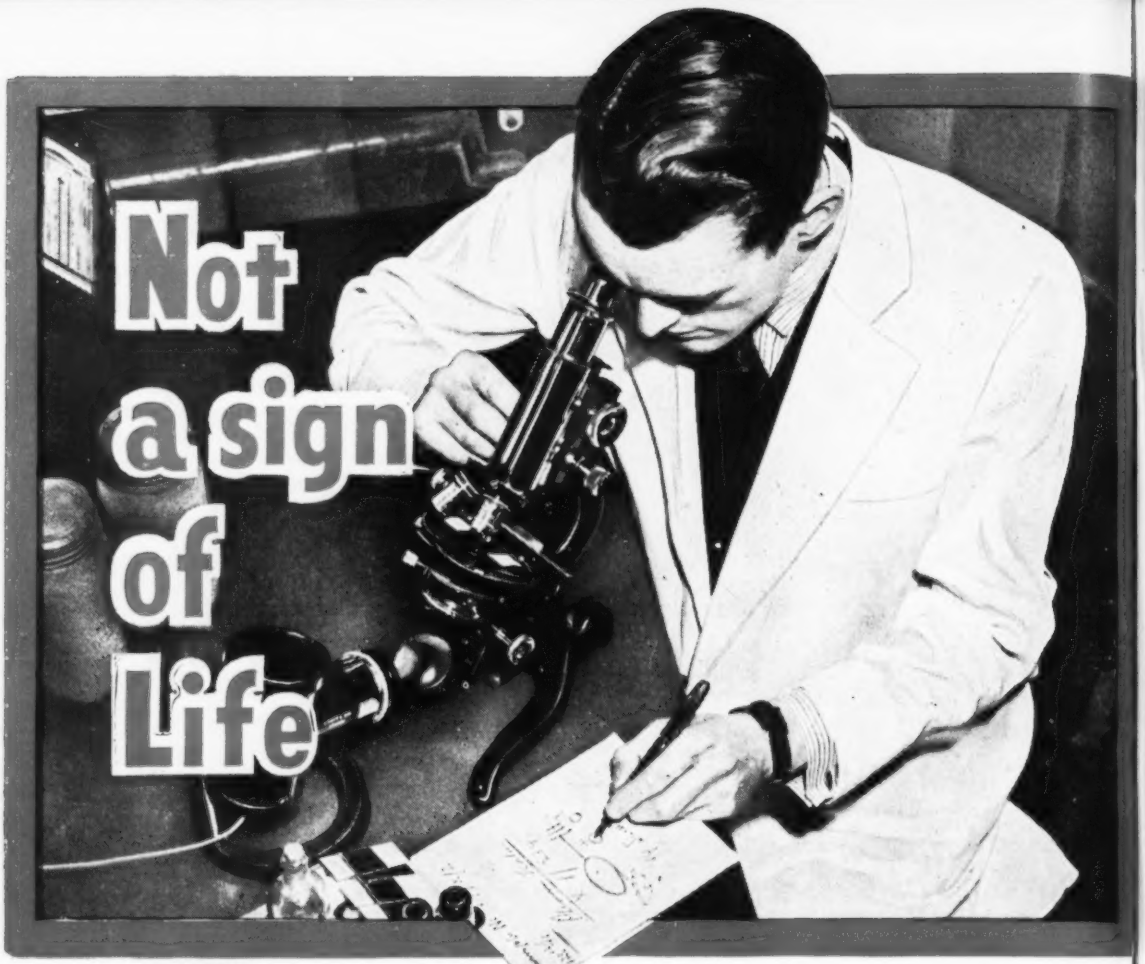

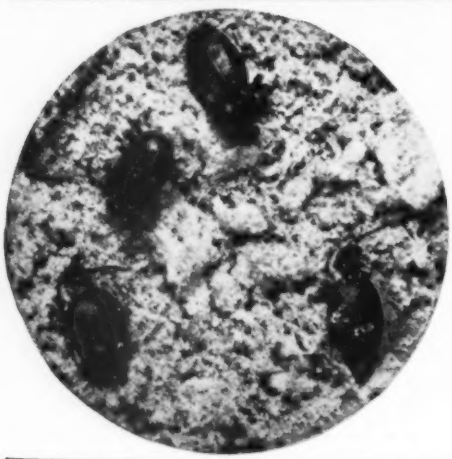

The spider beetle (Ptinus Tectus Sp.) feeds on a wide variety of bas foodstuffs; in this country it is the most common of all the insect pests th infest stored products. Our small illustration shows spider beetles in sample of cocoa, which has been in our possession since June 20th, 19 At that time the sample was divided into two parts, neither of which show any sign of life. One of the two parts was treated in an Entoleter cent fugal machine, and both parts have since been kept separate under seal, precisely similar conditions. To-day, two years later, the treated samp still shows no sign of life, but the untreated sample is heavily infested, as t illustration shows. This experience is typical of many others. Entole centrifugal machines can guarantee that your products, provided they a properly packed, will remain free from all forms of insect life, however lo they may be stored before consumption. Post the coupon below for fu information on the Entoleter continuous control system.

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FOOD MANUFACTURE

Vol. XXIV. No. 6 · Published Monthly · June 1, 1949

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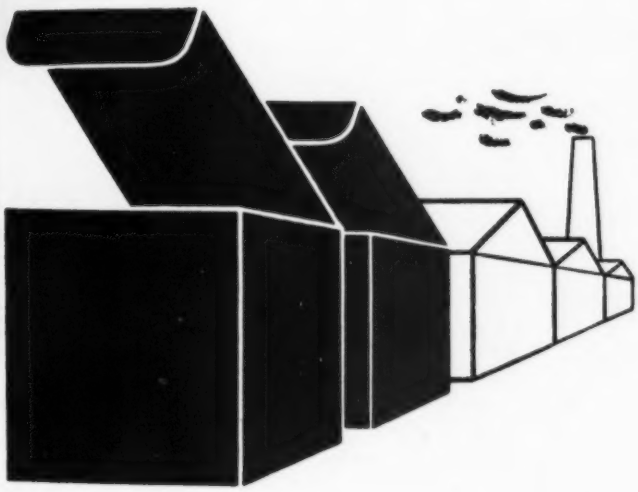

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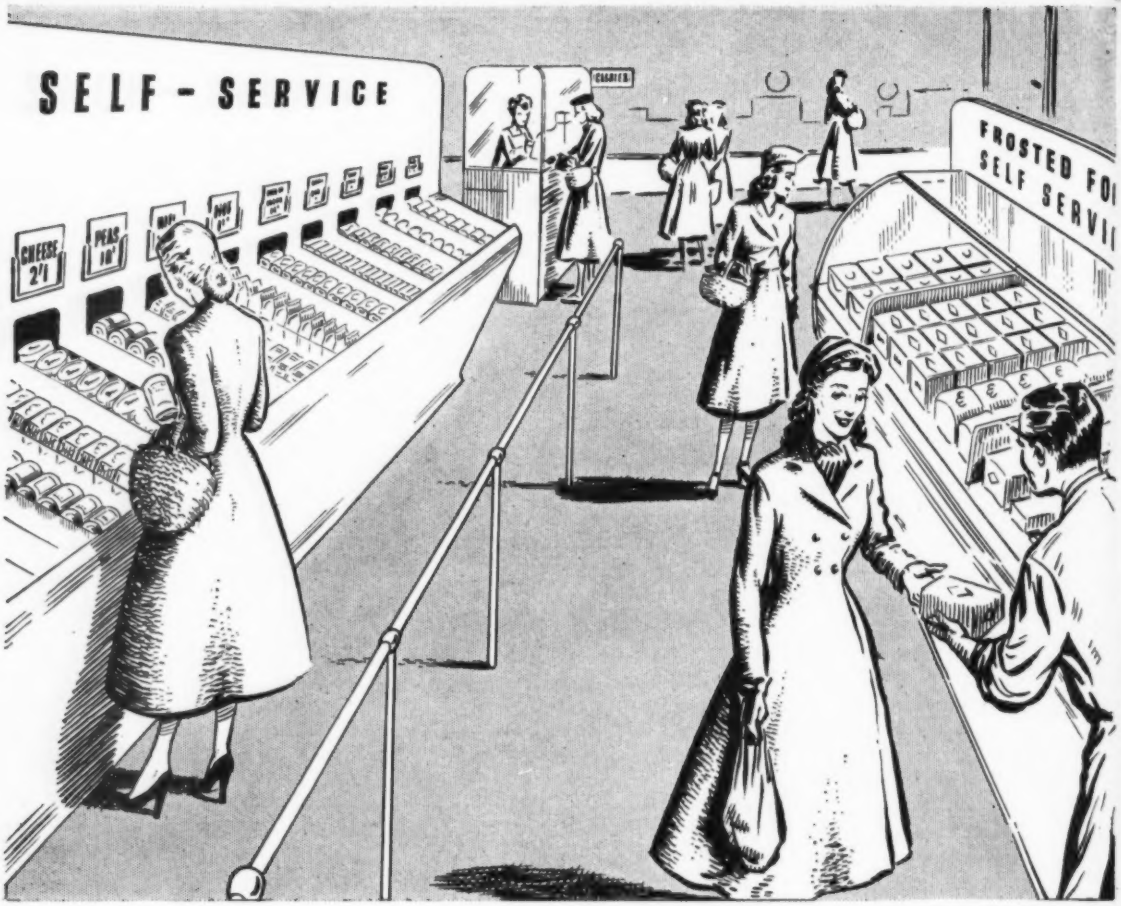

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FOOD MANUFACTURE

Vol. XXIV, No. 6 June 1, 1949

Survey of Food Markets

THE gradual change of direction of the food markets is in great measure beyond our control; and yet the new forms they assume are of intense interest to us as importers of food. Thus it is significant that in 1948 the United States food imports rose by 20 per cent. in value above the 1947 level. The gap between exports and imports was consequently reduced; the total gap was, in fact, reduced by between 40 and 50 per cent.

A further reduction in the gap may be anticipated in 1949; but at present it looks as though this will chiefly result from the predicted fall in food exports. The increased production capacity in Europe, and the dollar difficulties, must inevitably make the surplus problem in the States even more acute than had been expected. The dollar balances are bound to be used increasingly for the purchase of machinery and equipment; and this will leave less for the acquisition of grain, dried milk, dried eggs, and bacon.

An examination of the export reductions in 1948 shows that they mainly affected feedingstuffs, maize, dried eggs, canned fish, dried milk, and cheese. There was a slight counterbalancing increase in the export of soya flour, raisins, currants, and flour products such as macaroni; but these are unlikely to develop further, and cannot in any case be reckoned of great importance. Far more interesting to us is the rise during 1948 of the American imports of vegetable oils and fats; the advance in value was from 7·9 million to 19·7 million dollars. Most of this was in the form of olive oil, presumably from the countries about the Mediterranean.

In the meantime the imports of barley, oats and other grains rose in value from 6·4 million dollars in 1947 to 28·8 million dollars in 1948. There were also some minor advances recorded in the imports of tea, cocoa, fruits, and nuts.

So far, then, we are observing in the States a movement towards the balance of food imports and exports that characterised the pre-war period. In those days the States entered the world market significantly only in respect of vegetable oils, fruits, and beverages. It appears that the demand for vegetable oils will rise still further, and this is perhaps the most serious trend that affects our own markets.

Corned Beef and Trichiniasis

A party of tourists was being shown round an ancient church in Europe, in which was deposited a lamp which had been replenished with oil and kept alight for 1,000 years. After this had been solemnly explained to the party, one of the tourists bent down and blew it out. "Well," said he, "it's out now anyhow."

This story came to mind when we were reading a letter in the *B.M.J.* on the handling of corned beef in butchers' shops. The procedure, says the writer, in the majority of shops is to open a large tin of corned beef and place the contents on a wooden cutting board. The same knife used for cutting uncooked sausages, uncooked beef, uncooked mutton, and slabs of sausage meat is used, without any attempt at cleaning it, for cutting slices of corned beef. The corned beef is then placed on the weighing machine plate, which quite normally is covered with blood. The corned beef is next, in some cases, wrapped in a small piece of grease-proof paper and placed on the top of the raw meat, but in other cases it is placed in direct contact with the raw meat. If parasitic worms and cysts are present in the meat, offal, sausage, etc., and evade the meat inspector during inspection, they will be transferred to the corned beef by knives, by butchers' hands, by the scales, and by contact with the raw meat. In 1941, it was proved after the outbreak of trichiniasis in Wolverhampton that this disease was endemic in the Black Country.

It is nothing less than grotesque that the work of chemists and bacteriologists as well as the exercise of every conceivable hygienic measure from the animal to the can should be snuffed out in a moment by a butcher's knife. We agree with the writer that the Ministry of Food and the Ministry of Health should turn their attention to this matter.

Will Whales become Extinct?

This year eighteen expeditions have taken part in the whaling season: three British, one South African, ten Norwegian, one Russian, one Dutch, and two Japanese. Together they have caught 30,000 whales, the maximum number permitted by the International Whaling Convention.

A writer in a recent article propounds a number of questions: What will happen to the industry in the future? Will history repeat itself? Will there be a decline in whale population because more efficient ships, bigger fleets, and a greater demand may exhaust the hunting grounds? There are already signs that the whole race of whales is being over-hunted and unless attempts at international control are more successful than in the past, the tendency to catch as many whales and to produce as much oil as is necessary and profitable will prevail in the future.

On the other hand, competition has already curtailed the profit margin, and the writer asks whether the number of whales that a killer boat can catch will tend to fall. The size of whales caught is tending to diminish—will it continue to do so? Or will excessive slaughter render the majority of expeditions so unremunerative that restriction or renunciation of whaling by some of the nations engaged in it will be imperative and will provide a breathing space so that the stock is not catastrophically depleted?

If the industry does not establish an equilibrium will there be, as of old, fluctuating periods of success and failure?

The writer in question does not attempt to reply to the queries he has raised, except to say that man should be sufficiently intelligent and should recognise that the whale is a limited resource and refrain from depleting and destroying it beyond repair. Some attributes other than intelligence occur to us in this connexion.

The Irish Bacon Market

As the Republic of Ireland now has sufficient bacon to meet all needs, it is likely that the quota system will be abolished very shortly. At present the quota is $66\frac{2}{3}$ per cent. of the 1940 distribution.

It is likely that a Bacon Export Board will be set up during the summer to control the volume and quality of cured meat for export to Britain.

Exports are unlikely to start until there is a sufficient surplus to enable quantities to be sent. While stocks are growing until the end of the summer, the amount which might be left over for export would be too small for handling by the British Ministry of Food.

Curers, who are getting busier every week, are anxious to have a statement of policy on the future. They are losing £1 a cwt. on bacon at present, and are only meeting costs through the manufacture of by-products and the export of certain offals. The factories will require considerable capital expenditure to put them in a condition to resume trade on a large scale. There has been talk of nationalisation and also of the curers being brought into a co-operative system. They are waiting to learn what the future holds for them.

Now that there are more pigs on the market, consequent on the increased supplies of feeding-stuffs, bacon curers are making a big effort to eliminate the heavy, poor-type animal which became so popular during the war. Their aim is to have producers concentrate on the 12 to 13 stone (dead weight) pig, which is regarded as the type most suitable to produce bacon of the high grade essential for the export market.

County Committees of Agriculture are co-operating in the campaign, which is regarded in trade circles as being of the utmost importance. The pig which the curers are seeking to eliminate is the animal of, roughly, 2 cwt., which was produced during the war at a flat rate when bulk was of more importance than quality.

After reaching 12 to 13 stone, pigs put on weight much more quickly—and much more cheaply—than in their earlier years, but their bacon is excessively fat. Now it is proposed that the price for good quality pigs of 12 or 13 stone, dead weight, should be about 190s. per cwt., as against 160s. to 170s. (sow rates) for animals exceeding this weight.

Meat Research in U.S.A.

The first conference on meat industry research held by the Council on Research of the American Meat Institute at the University of Chicago was the occasion of the presentation of some interesting papers on meat research.

The organisation of the Meat Institute Foundation and the co-operative relationship with the University of Chicago were discussed briefly and research projects under way in the laboratories of the Foundation were reviewed.

Fundamental studies of the physiological characteristics of bacteria associated with surface greenish discolorations have yielded information of much value in developing practical methods

for control and prevention of surface greening in sausages and cured meats. Every greening micro-organism studied from natural outbreaks has been found to be a member of the lactic acid group of bacteria and to have common characteristics.

Studies on the action of nitrites on bacteria show that they have a definite (but not absolute) bacteriostatic effect on meat. This effect is influenced by the acidity and presence or absence of oxygen.

Extensive studies resulted in the production of a superior antioxidant for animal fats (AMIF-72) which contains butylated hydroxyanisole, propyl gallate, and citric acid. It is claimed to be unique in its effectiveness in protecting from rancidity foods made with lard.

Chemical and spectrometric studies on the autoxidation of fats have yielded fundamental information on the chemical changes occurring during the development of rancidity in fats and the mode of action of antioxidants in retarding rancidity.

Other studies include the nutritive value of meat scrap and tankage, methods of preparation of casings, the amino acid composition of fresh and cooked cuts of beef, pork, and lamb, factors affecting the uniformity of cured bacon, the respiratory enzymes of meat tissues and physical, chemical, histological, and organoleptic characteristics of beef as related to grade.

Alternatives to Heat in Food Sterilisation

There is a marked trend among those who are conducting research in the canning of foods to attempt to avoid undue heat treatment in the sterilisation process. A year or so ago it was announced that at the Massachusetts Institute of Technology a machine would be built in 1949 that would produce cathode rays at high voltage powerful enough to penetrate small cans and sterilise the food within the sealed containers.

Much power is required to inactivate enzymes and it may be that a simple heat treatment for this purpose, together with cathode or X-rays to kill the micro-organisms, would be a workable combination. Another possibility, it has been suggested, is a brief radar treatment.

Cathode rays and X-rays excite the molecules irradiated until the more complex ones break down. This action is presumed to be responsible for killing the living organisms. However, the rays may also affect those molecules responsible for flavour, colour, and nutritive value. Treated butter and olive oil become rancid more quickly and vitamin C in orange may be destroyed. Such difficulties may be overcome by better knowledge of proper dosage and other conditions.

There are also a good many difficulties to be overcome before this method can be adopted in commercial canning operations. Expensive and bulky equipment is required and the food industry must continue for the present at all events to depend on heat, avoiding its undesirable effects as much as possible.

Apart from canning, there is accumulating quite a respectable volume of experimental work by European chemists and physicists on X-rays and ultra-violet irradiation, and we are given to understand that some extensive work is being done on these methods in Sweden. An interesting article appears in this month's issue of *The Dairyman* treating of ultrasonics and other alternatives to the pasteurisation of milk by Dr. J. G. Davis which reviews the subject from its historical beginnings to the state of knowledge in the present day.

Trouble over Honey

Two Surrey bee-keepers and wholesalers of honey had to pay a total of £90 in fines with 150 guineas costs after pleading guilty to eighteen summonses relating to the sale of honey. Six of the summonses were for describing as "Pure English Honey" honey imported from abroad. The defendants were accused of selling their honey to retailers in Surrey and elsewhere, in one brand as honey imported from Australia, and in another brand as "Pure English Honey direct from the producer." The imported honey, which was on points, cost about 1s. 9d. per lb., and the pure English honey, which was off points, averaged 5s. per lb.

Mr. L. G. Scarman, prosecuting for the Surrey County Council, said that it was extremely difficult to carry out an analysis to detect the country of origin of the product and described in a picturesque manner the way in which it was carried out. "Pollen enters the honey because the bee when he produces the nectar from the flowers extracts a certain amount of pollen. It is the intention of the flower that the bee should carry the pollen to another flower, but things do not always work out in that world, as they do not in this, with the result that a certain amount of pollen gets into the honey."

Analysts and botanists were arrayed against the peccant bee-keepers and the presence of pollen from eucalyptus and Australian wattle was con-

firmed. "It was therefore apparent that there was an ingredient in this honey which could not possibly have come from English flowers and therefore, it would logically appear, from any bee operating in England."

There was not much that the defence could say. It was suggested that English bees had taken some imported honey from used containers outside the workshop, but Mr. Scarman said that the suggestion that the bees might be the guilty party was not tenable.

This raises a number of points. It would seem that it is not very encouraging for the bee "operating" in Australia to think that his product should fetch only 1s. 9d., compared with the product of his English competitor at 5s. per lb. He might also accuse his English opposite number of attempting to pass off Australian stuff as his own.

There is a distinct danger that investigations into the origin of honey by identification of pollen may become obsolete. In the Rothamsted report for 1947, the work of Mr. C. R. Ribbands is described and he has found that, when anaesthetising bees, chloroform is a very satisfactory medium and does not affect either their memory or behaviour. Carbon dioxide and nitrogen were less successful as bees tended subsequently to collect nectar only from plants where they had formerly collected both pollen and nectar. Whether this will result in a world-wide practice of anaesthetising overseas bees in order to simulate English honey is a matter about which we have considerable doubt.

Avoiding Over-specialisation

The now time-worn definition of a specialist as a man who knows more and more about less and less is uncomfortably realistic; yet in every field of progress we have to rely increasingly upon him. In science as well as in other activities the all-rounder—the really good all-rounder and not the mere *dilettante*—is becoming an extinct species.

In recent years agricultural science has come in for some particularly violent criticism from those who distrust specialists. The late Sir Albert Howard thundered in many articles and several books about the dominating role of the inorganic chemist in soil research, and only this spring a well-known agricultural writer, Laurence Easterbrook, in a leading article in the *News Chronicle* suggested that most of our agricultural science had been falsely based upon the work and ideas of "men with test-tube mentalities."

We were therefore glad to see that Sir William Ogg, in the Director's Preface to the latest annual report from Rothamsted Experimental Station, has deliberately replied to this kind of criticism. "Although the Station is organised in departments the work is not carried out in watertight compartments. Many of the investigations are carried out jointly between different departments. For instance, a joint piece of work on nitrification is being carried out by the departments of Soil Microbiology and Biochemistry; the departments of Chemistry and Biochemistry have been co-operating on manganese investigations, and there has been the closest association between Biochemistry and Plant Pathology for many years . . . these are merely a few instances of the co-operative work which is now in progress."

Although Sir William did not say so, it is of course the special function of the Director of a research organisation to make sure that this inter-departmental co-operation "works"; it is the Director himself who must specialise in being an all-rounder. So long as our food and agricultural research is conducted in this spirit and led by men who are themselves imbued by it, we can ignore the dangers of specialisation. So long as there are enough men and women getting to know "more and more about less and less" and so long as they keep in close contact with one another, their total contribution to progress will enable all of us to know more and more about more and more. It is as simple as that.

And Now Kangaroo

It has been suggested that variety might be added to our diet by the import of kangaroo tails. According to "Northerner" of the *Yorkshire* Post, kangaroo tail soup was introduced into this country fifty years ago and proved popular with the public, who discovered that it was "rich, highly nutritious, and possessed a fine, herby flavour."

> Nothing is sacred to the hungry man,
> Larder traditions he perforce must break:
> Austerity has tamed leviathan
> And brought it to his table dressed as steak
>
> The queerest fish that populate the sea,
> The most ambiguous in form and taste,
> Science has voted nourishing for tea
> Meet for the canners' craft, the potters' paste.
>
> And now, the ox grown skinny, doom o'ertakes
> The prairies' child, the darling of the zoo:
> It's on the record that the *gourmet* makes
> Succulent soup from tail of kangaroo.

Pectin from Sisal Waste

In the laboratories at Bulstrode House in Buckinghamshire, scientists of the A.S.P. Chemical Company have for some time been trying to ascertain whether or not valuable chemical substances are contained in what remains of sisal leaves after fibre has been extracted by decortication.

RECOVERED sisal fibre and tow represent 3 per cent. of the total weight of the leaf. Prior to the initiation of the present research scheme, the remainder was regarded as waste, and pre-war figures for such waste amounted to 300,000 tons of East African sisal per annum.

Experiments have shown that four principal groups of products may be obtained from the processing of sisal waste. If the cold extraction process is used they are, in order of production, water extract containing traces of malic acid, succinic acid, citric acid, glucosides, sugars, and saponins; the chemical extract containing pectic compounds; the solvent extract containing chlorophyll, xanthophyll, and wax; and the residual materials from which acetic acid, butyric acid, sugars, lignin, and fillers for plastics may be obtained.

The second group containing the pectates will be of most interest to the food manufacturing industries. This chemical extract is about 15 per cent. of that part of the dry leaf which remains after fibre and tow have been extracted. Pectins comprise a negligible proportion of the chemical extract, but the pectates (sodium, calcium, and other metallic "salts" of the acid) are also being produced.

Pectates are of the most importance since they are already being produced on a commercial scale in pilot plant quantities.

Above: **A partial view of the extraction vats.** *Below:* **Pressing the flesh.**

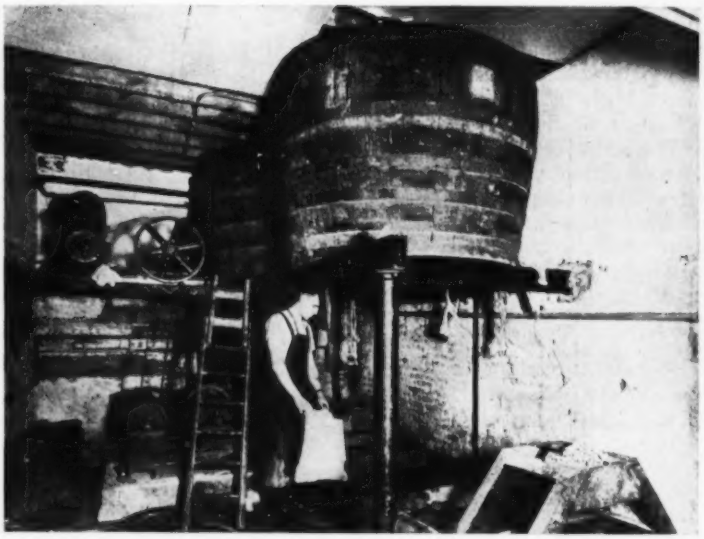
Pectates are being extracted from sisal flesh as compounds of sodium, and a brief reference to the properties of sodium pectate will indicate the importance that it plays in many industrial processes. It disperses in hot water to form viscous colloidal solutions; if more than about 1 per cent. of pectate is present the hot gel sets on cooling in the presence of small concentrations of calcium. Gels are also produced by the acidification of sodium pectate solutions, or by the addition of them to metallic salts such as those of calcium. Partly gelled mixtures of pectic acid (or calcium pectate) and sodium pectates somewhat resembling gum tragacanth can be made. Sodium pectate acts as a protective colloid and as an emulsion stabiliser; solutions can

Precipitation vats.

be dried out to water-soluble, non-sticky, and non-absorbing films. Zinc pectate solutions, made by peptising the salt in ammonia, dry out to soluble films by loss of ammonia.

The thickening, gelling, stabilising, and clarifying properties of sodium pectate have made it valuable in the food processing industries, which are at present the principal market for the limited quantities of this product that are available from sisal waste. It may be used as a thickening agent in soup, as a gelling agent in milk products, jellies, jams, and confectionery, as a stabiliser for ice cream and artificial cream, and as a clarifier for fruit juices and beer.

The process at present in use at Bulstrode for the extraction of pectates depends on hot extraction, so that the acids, glucoside sugars, and saponins produced by the cold process are not extracted.



Collecting gel after precipitation.

Dewatering the gel.

Before the process is commenced the compressed flesh is taken from the bale and put through a beater which removes any unwanted tow that remains. The loosened flesh is then transferred to extraction vats and treated with dilute sodium carbonate solution at 90° C. The flesh is stirred with the carbonate for about half an hour until most of the pectic contents have been removed.

A yellowish liquor and a mushy sludge result from this reaction, and they are run off into filter baths of stainless steel. When the mixture of sludge and liquor is separated in the baths, the sludge is subjected to pressure and filtration in a cider press. Sisal fibre cloth replaces the usual woollen filter cloth, since it has been observed that the alkali in the filtrate attacks the fabric of the wool. The filtrate of the cider press is run into the tank containing the original liquor from the vats.

From this tank the liquor is passed to a stainless steel heat exchanger to cool. This is an important part of the process because it is known that a hitherto unidenti-

fied bacterium destroys the pectate at 60° C.

Emerging from the heat exchanger, the sodium pectate in the liquor is precipitated with sodium chloride. At this stage the pectate is an off-white flocculated gel which is dried off for easy handling. The pectate obtained is of obscure composition; it is known that the material is a pectate, but its chemical formula is as yet unknown.

Drying of the pectate at the present stage of development is somewhat crude, but, nevertheless, successful. The gel is poured into linen bags which are hung so that part of the moisture drains away.

Above: **The extrusion and drying room.**

Left: **The material is pressed after dewatering.**

Below: **Grinding and sieving the pectate.**

After hanging, the bags are piled in layers and press out unwanted liquid by their own weight. After this pressure stage the bags contain about 10 per cent. solids. The gel is then subjected to pressure in a cider press, after which treatment it contains about 25 per cent. solids.

In this easily handled state the material is put through an ordinary sausage machine and spun into long spaghetti-like threads in preparation for oven drying. The mincing increases the surface area and allows better access for hot air in the drying oven.

The temperature in the drying oven is maintained at about 80° C. until the pectate contains about 7 per cent. moisture. The dried product is dark brown in colour and brittle to the touch. It is then ground to powder and sieved ready for marketing.

Although only small quantities of this material are available to the food processing industry, there have been heavy demands for it which will warrant the establishment of a full-scale plant for its production.

Ministry of Food

Latest Statutory Instruments

The list given below is the continuation of the list of Orders published in *Food Manufacture*, May 1, 1949, page 220.

No.	*Date.* 1949.	
		PRICE FIXATION
701	Apr. 18.	Order amending the Table Jellies (Maximum Prices) Order, 1946. Revokes S.R. & O. 1946, No. 1796.
778	„ 24.	The Meat (Maximum Retail Prices) Order, 1949. Revokes S.R. & O. 1942, No. 2460; 1943, Nos. 327 and 956; and 1945, No. 578.
782	„ 24.	Order amending the Meat Products and Canned Meat (Control and Maximum Prices) Order, 1948. Revokes S.I. 1948, No. 2707.
783	„ 24.	The Meat (Maximum Retail Prices) (Northern Ireland) Order, 1949. Revokes S.R. & O. 1943, No. 641.
		BEVERAGES
762	Apr. 24.	Order amending the Coffee Essence (Control) Order, 1942.
		EGGS
612	Mar. 31.	The Eggs (Great Britain) Order, 1949. Revokes S.R. & O. 1946, Nos. 880 and 2039; 1947, Nos. 38 and 1885; S.I. 1948, No. 592; and 1949, No. 272.
613	„ 31.	The Eggs (Northern Ireland) Order, 1949. Revokes S.R. & O. 1947, Nos. 535 and 1886; S.I. 1948, Nos. 593 and 2236; and 1949, No. 306.
		FRUIT
694	Apr. 10.	Order amending the Canned Fruit and Vegetables (No. 2) Order, 1946.
734	„ 25.	Order amending the Imported Apples Order, 1948.
		MILK
525	Mar. 27.	Order amending the Milk (Control and Maximum Prices) (Great Britain) Order, 1947. Revokes S.I. 1949, No. 307.
		MINERAL OIL
614	Apr. 9.	The Mineral Oil in Food Order, 1949.
		PERSONAL POINTS
699	Apr. 24.	Order revoking the Rationing (Personal Points) Order, 1948. Revokes S.R. & O. 1946, Nos. 1099, 1779; 1947, No. 595; S.I. 1948, Nos. 1632 and 2509.
		POINTS RATIONING
303	Feb. 27.	Order amending the Food (Points Rationing) Order, 1948.
		PRESERVES
695	Apr. 10.	Order amending the Preserves Order, 1947. Revokes S.I. 1948, Nos. 1324 and 1640, and S.I. 1949, No. 4.
		RATIONING
541	Mar. 27.	Order amending the Fats, Cheese and Tea (Rationing) Order, 1948.
700	Apr. 24.	Order amending the Sugar (Rationing) Order, 1948.
777	„ 24.	Order amending the Meat (Rationing) Order, 1948.
781	„ 24.	The Chocolate, Sugar Confectionery and Cocoa Products Order, 1949. Revokes S.R. & O. 1944, No. 451; 1945, No. 598; 1946, Nos. 1365, 1639 and 2233; 1947, No. 1927; S.I. 1948, Nos. 233, 1962, 2470, and 2612; and 1949, No. 190.
		VEGETABLES
252	Feb. 28.	Order revoking the Soft Fruit Order, 1947 and the Root Vegetables Order, 1948.

Future of the Imperial Institute

FROM April 1 the financial and administrative control of the scientific activities of the Imperial Institute, South Kensington, were transferred to the Colonial Office, and that of its Empire educational work to the Ministry of Education.

In a foreword to the annual report for 1948, Sir Harry Lindsay, K.C.I.E., C.B.E., the Director, summarises briefly the story of the Institute since it opened in 1893, and states that, in his view, the changes now made are undoubtedly wise, and will provide for normal expansion in new directions of value both at home and overseas.

The two main sections of the annual report reflect the growing interest of the State, as well as of commerce and science, in new Empire sources of minerals, abrasives, oil seeds, plant fibres, tobacco, hides, skins, essential oils, and insecticides.

The work of the Plant and Animal Products Department includes plans for a world-wide series of analysis of the insecticide pyrethrum flowers.

To assist the general plans for increasing world supplies of vegetable oils and fats, tests of sunflower seeds, four new and two older strains, have been made in Nigeria and Sierra Leone. In the former colony the new strains showed an oil content of 33 per cent. to 35·8 per cent. and the older ones 27·6 per cent. to 28·9 per cent., although one of the latter gave a greater quantity per acre owing to a heavier plant yield. In Sierra Leone the oil content of two of the new strains was 23·6 per cent., that of two others from 27 per cent. to 30·4 per cent., while the older varieties yielded 22 per cent. to 26·5 per cent.

The Curing of Bacon with Acid Brines

Part II

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In Part I of this article, published in May, were discussed experiments made with the object of establishing whether putrefying bacteria survived in an acid environment during the curing operation. The author here gives his conclusions.

THE properties investigated may conveniently be divided into groups, according to the way in which they varied with the progress of the experiment:

1. Properties which showed differences between the cures in hydrochloric and acetic acids, and which were the primary source of interest in the experiment.

2. Properties showing no significant change throughout the experiment.

3. Properties showing change in relation to the progress of the experiment, *i.e.* to the number of pickling cycles previously carried out, but not exhibiting differences between the two treatments.

4. Properties apparently correlated with variations inherent in the fillets themselves and not obviously related to the experimental treatment.

The Results Summarised

The results are considered in the above order.

1. Differences between the two series of cures are set out in Table I.

The main interest lies in the quantities of acid needed to maintain the *p*H of the pickles. After curing four or five batches of meat, the quantity of acetic acid needed to restore the *p*H began to increase steadily, and after about ten repetitions had become very large. The rising concentration of acetate in the pickle was reflected in greatly increased buffering power; not only towards the addition of further acid, but also towards the change brought about by pickling the fillets. It is regretted that no confirmatory estimations can be given of the actual concentrations of acetate. By contrast, the quantity of hydrochloric acid needed, initially about the same as that of acetic, remained practically unchanged throughout and the chief practical point is unmistakable: in controlling the acidity there is a vast difference between the two types of acid. There is some suggestion that, even with hydrochloric acid, slightly more was needed in the later stages of the experiment, probably because (*a*) the meat at that stage was relatively alkaline (*cf.* Table III), and (*b*) because of the extraction of buffering substances from successive fillets, but this change is insignificant compared with that with acetic acid.

The second difficulty anticipated was the development of foreign flavours in the meat, owing to absorption of a portion of the acetate ions accumulating in the pickle. The taste panel, having been previously accustomed to the flavour of sodium acetate in solution, attempted to distinguish it in the meat. The results are in Table I. At first they appear to favour the view that the acetate did give rise to a special flavour, as acetate scores were in general more frequently allotted to meat cured in the acetic pickle; and statistical analysis (*t* test) of the difference in marking between the corresponding members of the thirty-six pairs of fillets suggests that differences of this order would occur by chance only about once in fifty times. The discrimination conspicuously failed during the last few cycles of the experiment, just at the stage when the concentration of acetate in the acetic brine became large, and it is therefore doubtful whether the panel was really able to detect a special flavour due to the acetate. This would not be surprising as the flavour is sweetish and not pronounced in comparison with those due to acid and salt: alternatively, it may be that acetate was not readily absorbed by the meat.

2. Among the properties showing no definite change throughout the experiment are, of course, some which were deliberately maintained constant. The concentration of chloride in the brines was kept constant, and the additions of NaCl needed to do this showed no consistent differences between the acetic and hydrochloric pickles (Table II).

Another more or less constant character was the acid flavour of the meat. This was expected, as the experiment was intended to produce meat with a given *p*H after curing. In fact, however, this was not done, as the variations in *p*H of the fillets before curing led to *p*Hs ranging from 5·2-6·5 after pickling. The acid flavour was slight, and it seems likely that variations of *p*H at this level had no effect on it. There was, however, a persistent foreign flavour, variously described as "metallic," "cardboardy," or "carbolic."

In contrast to a normal curing pickle, in which

Tables I, II, and III appeared in Part I, published in the May issue.

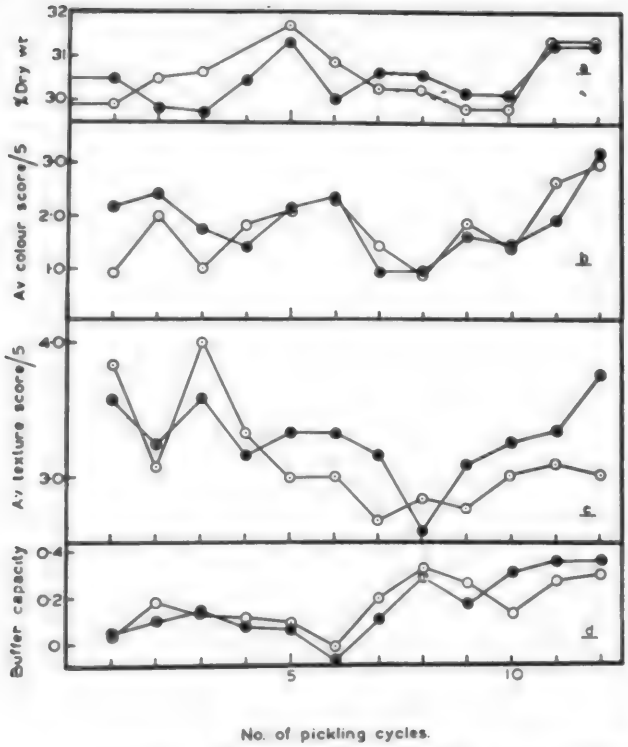

Fig. 2.—Properties of cured meat apparently varying with the nature of the fillet pairs, instead of with progress of the pickling cycles. (a) Dry weight of cured meat. (b) Colour of cured meat. (c) Texture of cured meat. (d) Buffering capacity of meat towards pickle (pH shift in meat as a result of pickling, per unit pH difference between av. pH of meat and av. pH of pickle).
⊙ Hydrochloric acid. ● Acetic acid.

the protein content and viscosity increase as the pickle is used, the viscosity of these acid pickles did not alter. Relatively little protein was dissolved in them during the pickling process; and on readjustment of *p*H, it was mostly coagulated, and settled as a voluminous flocculum which was filtered off. This would clearly cause trouble in large-scale operations. The pickles in consequence never acquired the rich red colour, slightly syrupy consistency, and frothing properties of a normal bacon-curing pickle.

No appreciable development of bacteria took place in the pickles. The acidity of the solutions, and the short duration of the experiments, hardly gave opportunity for this. The acidity engendered in the meat was not, however, sufficient to prevent the development of micro-organisms on the meat after pickling: in this respect there was no significant variation between the hydrochloric and acetic cures, nor with the number of curing cycles. Moulds occurred abundantly.

3. It is difficult to decide the explanation of the way in which some of the properties varied with the progress of the experiment through the repeated cycles, as the fillets were more alkaline in the later cycles, and this may be the cause of some of the effects observed. The magnitude of this disturbing factor will be evident from the *p*Hs of the fillets, both before and after pickling, which head Table III.

In a few instances the reason for the change was obvious. The concentration of nitrite in the brines diminished steadily as it was removed by the meat and not replenished. The disappearance of nitrite followed a similar course, but was much more rapid, which may be attributed to steady oxidation in acid solutions and also to uptake by myoglobin: it is clear that in any repetitive system of acid curing it would be essential to make repeated and controlled additions of nitrite.

A change most probably related to the progressively decreased acidity of the meat was the gradual diminution in the weight gained by the meat as a result of pickling. Callow[9] has shown that the exchanges between fillets and brine are restricted if the meat is relatively alkaline.

It appears that the salty flavour of the meat was diminished even more than the salt-content. Moreover, the data of Table III show that the salty flavour developed by unit quantity of salt correlates better with *p*H than the quantity of salt itself. These facts argue a special effect of alkalinity on the development of salty flavour. It may be that this, too, was due to the effect of alkalinity in restricting osmotic exchanges by the meat, which would hinder the free liberation of salt to the palate when the meat is chewed.[10]

At the same time it should be remembered that one of the features associated with the maturing of curing pickle is the disappearance of the raw, salty flavour of the cured meat. In this connexion the comments in Table III of the taste panel on the components of flavour attributed to the meat in the experimentally cured material should be noted. With samples from the beginning of the experiment, there were frequent comments of porky flavour; less frequent with those from the later cycles of the series, where there were instead occasional observations that the flavour was coming to resemble that of cured meat.*

It will be plain that further investigation is desirable to elucidate these points, while avoiding the

* The description "cured" is used here in a rather liberal sense. Except in the examples here specified, the flavour of the pickled meat (even after maturation) did not closely resemble that of normally cured bacon. It may be doubted whether it is possible to obtain this, in work on such a small scale, even when normal curing procedures are used.

simultaneous variation of alkalinity of meat and progress of curing cycles.

4. A few of the properties of the cured meat seemed to be related to those of the original fillet rather than to alterations of experimental procedure. This is indicated by correlation between the properties of the hydrochloric- and acetic-cured members of a pair of fillets without any relation to the other factors in the experiment.

A simple example is the dry weight of the cured meat. Fig. 2A shows that the proportion of water remaining in the meat after curing behaved in this way, being chiefly determined, presumably, by the proportion of water in the meat before curing.

Two less obvious examples are the texture and colour of the cured meat. The observations are in Figs. 2B and 2C. In neither case is there any systematic grouping of the data in relation to the number of pickling cycles and thus to the alkalinity of the meat, which is particularly interesting in relation to colour, as it has been suggested that *p*H and colour are related.[11]

Buffering Power of the Fillets

The buffering power of the fillets towards the acid also seems to have behaved in this way, as might be expected from the correlation between the *p*Hs of opposed pairs. Buffer capacity has been estimated by dividing the change in *p*H as a result of curing by the average difference in *p*H between the fillet and the brine. The values so obtained are set out in Fig. 2D. It may be noted that the points for the last three curing cycles are irregular. This method of deriving the buffering power of the meat assumes a fixed buffering power in the solution, an assumption clearly not true of the acetic pickle in the last few curing cycles. The rapidly increasing buffering power here would be expected to cause a greater shift in the *p*H of the meat for a given difference between it and the brine, and this would lead to irregularities of the nature recorded.

Maintenance of Acidity

The results of the investigation support the thesis on which it was based. For maintaining the acidity of an acid curing pickle it would be a mistake to use weak acid such as acetic or lactic, for the accumulation of its anions in the pickle soon creates a high buffering power, so that large amounts of acid come to be required. Nothing can be done except to throw the pickle away and begin again. The pickle thus never has opportunity to mature, and the constant replacement would be a serious expense, so that the system does not recommend itself for commercial practice.

A moment's consideration will suggest that the addition of buffer mixtures is even less likely to permit continuous re-use of the pickle, for on addition of a buffer mixture a state of affairs would be produced similar to that in the acetic pickle after several curing cycles.

The use of a strong acid such as hydrochloric does not give rise to this difficulty, and it can also avoid the possibility of the development of peculiar flavours due to alien ions. In all other respects there appeared to be no difference between the two types of acid. The flavour, texture, and colour of the cured meat were as good with hydrochloric as with acetic. The impression might prevail that strong acetic acids may not be used, since they are liable to "scorch" meat, but this is true only because even dilute solutions of strong acids attain *p*Hs below 3-4, which is impossible with weak acids. When strong and weak acids are used under controlled conditions at the same *p*H, it seems that their effects on the meat are indistinguishable.

Disadvantages of the Acid Cure

This is not to say that the use of strong acids provides a completely satisfactory procedure, for there still remain disadvantages which would be associated with any acid cure. One is the speedy disappearance of nitrite from the brine, entailing frequent controlled addition, which may again become illegal in normal times.[12] A second is the filtration involved in removing the flocculum of protein formed when the *p*H is adjusted. Perhaps the most serious defect, however, might lie in the quality of the product. It may have been noted from the data that the colour and texture of the cured meat were poor by normal standards, the average scores being about 1·5 out of 5 and 3·2 out of 5 respectively. The poor colour might have been partly due to shortage of nitrite, but it was not noticeably better in the early stages of the experiment, where there was adequate nitrite in the brine and nitrate from which it could have been developed during maturation (the nitrite of normal bacon is mostly formed during maturation[13]). The panel also frequently observed foreign flavours, and it has already been remarked that the flavour was not that of properly cured bacon.

How far these defects were wholly the result of the acidity is doubtful, for it is hardly possible in such small-scale experiments to reproduce the standard of quality characteristic of good commercial practice. It is an ill omen, however, that in this experiment the very moderate degree of acidification was enough to spoil the eating quality without greatly increasing the storage life.

If the question of acid cures is to be pursued, further investigation is desirable: to find the exact relation between the *p*H of the cured meat and its storage life, and to relate the *p*H of the meat to the organoleptic properties—colour, texture, and salty flavour. With this information it would be possible to choose the best *p*H for the meat, and an attempt might then be made to carry out the appropriate curing operation over a considerable period of time, using a strong acid to maintain the brine at the correct *p*H. It is worth adding that, so

far as assessment of the quality of the meat is concerned, such a trial would have little meaning unless it were carried out on a reasonably large scale under commercial conditions.

Summary

1. Successive samples of pork have been cured with pickles of *p*H about 4·5, the composition being maintained by additions of acid and salt.

2. Two pickles were used. In one the *p*H was restored to 4·5 after use with hydrochloric, in the other with acetic acid. Operations in the two pickles were kept in step, opposite members of pairs of *psoas major* muscles being immersed in the two pickles, to ensure similarity of material.

3. Records were made of the composition of the pickles, the quantities of acid and salt added, and the properties of the pickled meat.

4. The chief results were these:

(*a*) The amounts of acetic acid needed to restore the *p*H increased steadily, and soon became large; there was also some suspicion of an unusual flavour in the meat. These changes did not occur with hydrochloric acid.

(*b*) Otherwise the effects of the two acids on the characters of the finished meat were indistinguishable.

(*c*) Some of these characters, especially salty flavour, showed gradual changes with the progress of the experiment, and were probably related to the original *p*H of the meat. Other characters, *e.g.* texture of the cured meat, were most closely correlated with properties of the individual fillets.

5. It is concluded that a strong acid is fundamentally more likely to be useful than a weak acid, but that in any form of acid cure the following difficulties will arise:

(*a*) Rapid disappearance of nitrite, and heavy precipitation of protein, in the pickle.

(*b*) Likelihood of relatively poor quality in the cured meat.

(*c*) These would be balanced against a possibly only moderate increase in storage life with probable appearance of moulds.

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ACKNOWLEDGMENT

This work formed part of the programme of the Food Investigation Organisation of the Department of Scientific and Industrial Research. The author was assisted by Dr. J. R. Hawthorne and Mrs. M. Ingram in carrying out the experiments.

Modern Packaging

A WORK* of 994 pages comprising every aspect of the American packaging industry is presented in nine sections, copiously indexed.

Seventeen recognised experts in packaging discuss requirements and problems peculiar to seventeen groups of products. Each discussion is followed by photographs illustrating practices in each group, and showing the wide variations in materials, structure, protective features, and appearance. In all, eighty-six experts contribute authoritative articles in this comprehensive work.

The charts, tabulations, and diagrams, so useful a feature in previous issues, have been extended to thirty, all of which have been reviewed and revised by the research departments of more than fifty prominent firms.

To indicate the extent and usefulness of these charts, the tabulation given to the "Properties of Packaging Films" may be quoted. Films are set out under the headings of "cellulose derivatives" (Cellophane plain, Cellophane moisture-proof, Cellophane moisture proof anchored, cellulose acetate, ethyl cellulose, cellulose acetate butyrate); "synthetic resins" (vinyl films, vinyl chloride or chloride-acetate polymers, saran, polyethylene); and "rubber base" (Pliofilm).

The properties of each of these types of film are given, and cover type of material, forms available, clarity, thicknesses, maximum width, square inches per lb., specific gravity, tensile strength, bursting strength, tearing strength, folding endurance, heat sealability, water absorption in twenty-four-hour immersion test, water-vapour permeability, permeability to gases, resistance to acids, alkalis, oils and greases, heat, cold, and sunlight, dimensional change, resistance to storage, and inflammability.

Of particular interest among the illustrated discussions in the section on "Packaging in Specialised Fields," are those devoted to bakery goods, beverages, confectionery, dairy products, grocers' products (dry and liquid), frozen, dehydrated and pre-packed foods, canned fruits and vegetables, meat, poultry, and fish. Other stimulating sections are "Planning Fundamentals," "Packaging Forms," "The Materials of Packaging," and "Display for Packaged Products." These, with the sections on "Machinery and Equipment" and "Shipping and Containers" broadly speaking, present a complete educational course in packaging.

Although there is plenty of evidence of American progress, and some of leeway to be made up in Britain, there is, however, nothing to indicate that in technical knowledge and ability our packaging experts are far behind.—F. E.

* *Modern Packaging Encyclopedia*. Pp. 994. Packaging Catalog Corporation, U.S.A. Price $6.50 (U.S.A.), $9.00 (Canada), and $11.00 (other countries).

Mushroom and Mushroom Spawn Production in Scotland

Until recently any attempt to grow mushrooms was regarded as a gamble, but nowadays scientific research has put matters on a different footing and mushroom growing is becoming a thriving industry throughout the world. The increase in mushroom production has naturally resulted in an increased demand for the spawn from which mushrooms are grown. This article describes a visit to the Scottish Mushroom Laboratories at Hogganfield, Glasgow, where both mushrooms and mushroom spawn are produced.

THE mushroom business began in a small way in 1931, since when it has developed to a stage where mushrooms are grown on the shelf system in fifty-two specially constructed houses, each containing 2,500 sq. ft. of bed space. There are also six sheds, rather similar to aircraft hangers, and some glasshouses, and when these are not required for other crops, floor-beds are laid down. During the warmer parts of the year outdoor beds are constructed and protected from the rain with a covering of straw and canvas.

The chief difficulty is to obtain a large enough supply of horse manure to keep all these houses in production, for the mushrooms grow on a compost of manure from 6 to 9 in. deep, over which a light covering of soil is thrown. As horses are everywhere being replaced by mechanical transport, manure is becoming alarmingly scarce, and experiments are being carried out at the laboratories and by growers throughout the country in an effort to discover a synthetic compost which will replace or supplement the diminishing supply.

Preparation of the Beds

The preparation of the manure for mushroom growing takes from eighteen to nineteen days. During this period it is turned four times, straw, water, and chemicals being added as required.

When satisfactorily composted, the manure is placed in the beds and brought to a "peak-heat" of 140° F. This temperature is maintained for

Preparing an outdoor mushroom bed.

twenty-four hours, after which the houses are allowed to cool gradually. Spawning is carried out as soon as the temperature falls below 70° F. The spawn is broken into pieces and planted at intervals in the beds. Three weeks elapse while the spawn grows through the manure, and when the beds are thickly impregnated with threads of mushroom mycelium, a "casing" or covering of sterilised soil is given to a depth of 1¼ in.

Cylinders of mushroom spawn.

The temperature is now held at 60° F. for three to four weeks, during which light waterings are given and the ventilation is carefully supervised. At the end of this time the crop makes its first appearance as a multitude of small "pin-heads," or baby mushrooms, which cover the surface of the casing soil. In from two to seven days, depending on the temperature, these pin-heads develop into fully grown mushrooms which are picked and despatched to market.

Thereafter the beds continue to crop in "flushes." This means that periods of heavy cropping alternate with rest periods, during which few mushrooms are produced, and the flushes of mushrooms continue to appear until the food value of the beds is exhausted or until conditions become unsuitable for growth. Over-watering, under-watering, poor ventilation, high humidity, excessive heat or chilling may all contribute to the failure of the most promising crop, quite apart from the ravages of insects and disease.

Gathering mushrooms in one of the sheds.

It is because of the susceptibility of mushrooms to disease that so many precautions are taken after cropping. At Hogganfield, as soon as the spent beds are cleared away, all bed-boards, baskets, wheelbarrows, tools, etc., are sterilised with a disinfectant solution and the sheds are cleaned and sprayed with a combined insecticide, fungicide, and bactericide. Where a bad outbreak of disease or infestation has occurred, it is necessary to fumigate the shed, which is an expert's job.

Mushroom growers have adopted mechanical methods; time and labour have been reduced by the use of automatic pumps, soil breakers, manure turners, a combined soil excavator and screener, and equipment for filling and emptying houses.

Spawn production developed naturally from the mushroom industry as a result of a search to obtain the ideal spawn, *i.e.* one that would run thick, fast, and strong, resist disease, crop heavily, and give mushrooms of good size and fine quality.

As this end was achieved, it was decided to put spawn on the market, and so Scottish Mushroom Laboratories were begun. Spawn production has now increased to such an extent that instead of being a sideline to the mushroom industry, it is now a flourishing concern on its own account.

Spawn Production

Highly scientific methods are employed. The pick of the manure brought on to the premises is devoted to spawn-making, and after being prepared, shredded, chemically treated, and reinforced with extra food constituents, it is packed into large glass jars and sterilised in autoclaves.

The jars are then taken to a specially constructed, double-doored, windowless, thermostatically controlled cubicle, where, in sterile air and under the rays of ultra-violet lamps, the jars are inoculated with the master cultures produced in the laboratory. The work is carried out by a trained worker wearing white overalls, a face-mask, and rubber gloves.

After inoculation, the jars are removed to the growing-rooms, where they remain for three weeks at a constant temperature of 72° F. During this time the threads of mycelium grow through the sterilised medium in the jars, and when it is completely impregnated, the contents of the jars are now ready for immediate despatch as "moist spawn," or after a period in the drying-room as "dry spawn."

Packing the Spawn

Every effort is made to see that the spawn reaches the grower in ideal condition. Moist spawn is wrapped in waxcraft paper, dry spawn in sulphur paper, both wrappings being impregnated with insecticide to ensure that no contamination reaches the spawn before planting.

For sale in shops the spawn is packed in attractive containers, and for delivery to growers it goes in large, wire-bound cases.

At present two new types of spawn are being developed, but these are not yet on the market. One is grown on a compost of tobacco stems, the other on grain. Experiments tend to show that spawn grown on these media will run thicker and faster than the present type, giving a quicker crop with less time for diseases to invade the beds. A new culture has been obtained which, it is hoped, will give a finer strain of mushrooms than any of the present varieties.

Over 60 per cent. of the spawn produced at

(*Concluded at foot of next column*)

the Scottish Mushroom Laboratories is exported, most of it going to France, Belgium, Holland, Switzerland, and Ireland. Mushrooms have always been more popular as a table delicacy on the Continent than in Britain, and it might have been expected that spawn-making abroad would be far in advance of the British industry, but this is not the case. The successful invasion of the foreign markets is a high tribute to the excellence of British spawn.

Chemical Research

DETAILS of Government research at the Chemical Research Laboratory during 1947 are contained in a recently issued report.* In the detailed description of current research contained in the Director's report, attention is drawn to developments in corrosion research, chromatography, and ion-exchange.

In the corrosion field, electrode potential measurements on painted steels have been supplemented by measurements of resistance and capacitance, the latter providing a sensitive means of detecting the initial failure of the paint film. Microbiological studies on sulphate-reducing bacteria have established that certain strains are capable of autotrophic growth, molecular hydrogen serving as the source of energy.

A great advance in the application of chromatography to inorganic chemistry has been achieved by the use of organic solvents in conjunction with solid adsorbent such as cellulose. The new technique has been applied with considerable success to the analysis of mixtures of inorganic salts. In conjunction with the polarograph, colorimeter, and spectrograph, chromatographic analysis promises to have many applications as a quantitative micro-analytical method for metals.

A promising start has been made on the programme concerned with the determination of accurate physical and physico-chemical constants of organic substances. Special apparatus has been constructed for the physical measurements and for establishing criteria of purity.

Useful contributions have been made to fundamental knowledge of ion-exchange reactions using synthetic resins. Studies of the *p*H dependence of the setting properties of resins derived from polyhydric phenols, notably resorcinol and formaldehyde, have helped to elucidate the mechanism of the setting reaction.

An investigation on the prevention of caking in mixed fertilisers has also been successfully completed.

* *Chemistry Research, 1947*. Pp. 91+iv. H.M.S.O. Price 2s. net.

Canning in South Africa

REMARKABLE developments have taken place during the last twelve years in South Africa's canning industry. Every canner used to have to make his own cans, and there can be no doubt that the difficulties involved acted as a deterrent in the establishment of new factories. At the present time most of the factories are obtaining their cans from professional can manufacturers. The industry is still entirely dependent on overseas sources for tinplate, but plans are being made for its manufacture in the Union, and it is hoped that these will mature in the near future.

According to the latest available statistics, there were twenty-one factories engaged in the fruit and jam canning industry, representing an investment of land and buildings of over a million pounds. Over three million pounds of South African raw materials were used; and 112,318,500 lb. sugar, valued at £791,000, were consumed by the industry.

The canning of vegetables increased during the war years to supply military requirements. At the end of the war the demand diminished to some extent, but it is anticipated that this type of pack will continue to be an important factor in the South African canning industry in the future.

Fish canning has until recent years been a neglected industry except for crawfish. The industry is now expanding rapidly, and it is anticipated that with the cessation of overseas deliveries under the exchange control regulations the demand for locally canned products will increase considerably.

Overfilling of Cans

ONE of the more common causes of springers in canned meats is overfilling of the can; others include low closing temperature, insufficient vacuum, delay between closure and can processing, incipient spoilage, leakage of can, excessive distortion of can ends in processing, and rough handling.

Overfilling occurs when the volume of the contents at ordinary storage temperatures is greater than the capacity of the can with both ends flat. Briefly the main causes are:

1. The use of cans with less capacity than required for the normal volume of the desired weight of product.

2. The filling of a greater weight of product into the can than is intended due to improper adjustments of mechanical fillers, inaccurate check weighing scales, carelessness in check weighing, or carelessness in hand filling without check weighing.

3. The trapping of gas in the can or in the product during filling which does not escape during exhausting, so that the normal volume of the contents of the can is increased.

4. The introduction of abnormal amounts of air into the product during mixing so that a given weight of product occupies greater volume.

5. The use of meat containing abnormal quantities of gases, resulting from bacterial growth. Such gases are in the product when the can is sealed. The gases are driven from the meat during the heat treatment of processing and are not re-absorbed by the product. These gases may increase the volume of the contents of the can.

6. Changes in the formula of the product affecting the volume occupied by a given weight. In general, decreasing the moisture content decreases the volume, and increasing the fat content increases the volume.

7. Addition of too much water or brine to complete the fill of the can. In some canning lines the fill of the can is completed with brine or water supplied continuously by a perforated pipe. When this procedure is employed, sufficient liquid should be removed from the can prior to closure so that the volume of the contents of the can after cooling to normal storage temperatures does not exceed its capacity.

8. Changes in methods of preparation affecting the volume of the product. Some steps in the preparation of meat products for canning which affect their specific gravity are: time of precooking, size of grind, and ways of conveying.

9. Filling cans as full as possible. Some canners deliberately fill cans with certain products as full as possible to minimise the headspace because these products become discoloured where they are adjacent to the headspace. In these instances a slight excess of product may cause overfilling. When filling an open-top can, the level of the product should be at least $\frac{1}{16}$ in. below the top of the flange of the can, unless the sealing temperature is sufficiently high to permit contraction on cooling to this headspace, because the inner side of the can cover after double seaming is $\frac{1}{16}$ in. below the top of the can. Overfilling may result from filling the can to the top of the flange.—*The National Provisioner.*

BOOKS RECEIVED

Orders for any of the books listed below or reviewed in this issue may be placed with the Books Department, FOOD MANUFACTURE, *17, Stratford Place, London, W.1. It is regretted that under present conditions it is not always possible to supply books by return of post.*

The Food of the People. By Sir Noel Curtis-Bennett, K.C.V.O. Pp. 320. Faber and Faber. Price 16s. net.

The English Heritage. By Rex Welldon Finn, M.A. Pp. 255+xix. MacDonald and Co. Price 12s. 6d. net.

Food and Other Frailties. By Romilly Fedden. Pp. 142. Seeley Service and Co. Price 15s. net.

Taste Differences in Individuals

R. W. MONCRIEFF, B.Sc.(Manc.), F.T.I., F.R.I.C.

What is painful to one person is usually painful to others ; what can be seen or heard by one person can be seen or heard by others ; what is sweet to one is sweet to others ; it would be difficult to find anyone who disliked the perfume of a rose. So strong is this belief in the uniformity of sensation, so implicit our acceptance of it, that we are at first inclined to look askance at differences when they reveal themselves.

COHN[1] apparently believed so unhesitatingly in similarity of response among different individuals that even when he came across cases where one person reported the taste of a substance differently from another, it does not seem to have occurred to him that the substance really did give different taste sensations to two individuals, but he thought that one of the observers must have been mistaken.

On the other hand, differences in likes and dislikes of food are everywhere manifest. There is often a tendency to pass over these differences as foibles; to think that the child who will not eat his cabbage is spoilt; that the man who refuses a ripe cheese is squeamish; that the cat who turns up his nose at yesterday's milk, or even at today's fish, is too well done by. If there is real hunger, food that would otherwise be rejected would be eaten. It is obvious that there must be differences in taste and flavour perception between different individuals. In some few extreme cases where the differences are very great and simply cannot be ignored, such as when a substance tastes very bitter to one person but tasteless to another, the subject has been carefully investigated. It is probable, however, that less acute differences in taste perception are widespread.

Factors Governing Taste Appreciation

In some cases, no doubt, the differences of appreciation are due to association of ideas; some particular flavour has been experienced in happy or unhappy circumstances and the reaction, largely independent of the intrinsic nature of the flavour, is pleasant or unpleasant accordingly. While most of us may have our own likes and dislikes for certain foods conditioned by the associations of ideas, such idiosyncrasies go practically no way towards explaining the very great differences that undoubtedly do exist in taste and flavour perception and appreciation.

Another factor when considering taste likes and dislikes is the part that can be played by other senses; two foods may have precisely similar tastes and yet if one looks appetising and the other does not, the taste of the former will invariably be preferred. A case is described by Pyke[2] of two chocolates identical in taste and consistency, but one white and the other brown. When compared by blindfolded observers they rated equally, but when the observers could see what they were tasting they considered the white chocolate fatty, tallowy, and generally inferior. The colour of food undoubtedly affects its attractiveness and according to Cox[3] this is partly due to the association of taste with the pleasing colours of ripe fruits, and the fact that some of Nature's colours and pigments have a value that is not only aesthetic but is also dietetic and nutritional, *e.g.* the carotenoid pigments, closely related to vitamin A, in tomatoes and apricots. In addition to appearance, qualities such as firmness, levelness, and body go to make up a food.

The Role of Odour

It is widely recognised that most of our appreciation of flavour is due to odour, and that apart from the four primary sensations of sweetness, sourness, saltiness, and bitterness, all of "taste," using the word in its colloquial sense, is due to the olfactory sensations that we experience, as particles of odorous food find their way through our nasal passages. It has often been reported that if the nose is held, many foodstuffs normally very different, such as boiled onions, apples, and turnips, taste nearly the same. Patients who have suffered damage to the olfactory nervous system so that they have become partially or completely anosmic, are usually reported to have lost their sense of taste, and to have become unable to distinguish one meat from another.

Such views are so widely held that one approaches with some hesitation evidence that contradicts them. Yet, during the 1939-1945 war, investigations carried out on men with head wounds afforded considerable evidence that runs contrary to these popular views. Leigh[4] has made a most interesting report as a result of the examination of 1,000 consecutive cases of head injury that came

into a military hospital. The subjects were tested empirically with coffee, camphor, eucalyptus, peppermint, and cloves; it was found that out of the 1,000 cases, 72 subjects had an impaired sense of smell; of this last number 41 cases suffered from complete anosmia. The most striking feature of this report is that of the 41 completely anosmic cases, all but six noticed no change in taste, and in the 31 cases of partial anosmia, only eight complained of taste disturbance. It appears that relationship between taste and smell is not so close as it is popularly thought to be.

Relationship between Taste and Smell

In this connexion it is interesting to note that Crosland, Goodman, and Hackett[5] reported in 1926 that patients suffering from anosmia were not inferior to normal controls in their ability to name foods placed in their mouths. Possibly taste is subserved by the olfactory stimuli more in some people than in others. Perhaps the view that the larger part of flavour is due to odour may have to be modified; possibly it applies only to a portion of the community.

Before leaving the subject of Leigh's work it may be well to mention one case that must be almost unique inasmuch as taste was almost completely lost and then recovered. The patient, suffering from a head injury, complained thirteen days after injury that food had no taste. When tested on the right side of his tongue he thought salt was "perhaps cane sugar" and quinine was "bitter although not very bitter," sugar was "salt." On the left-hand side sugar was "salt" and quinine was "salt." Perhaps because saltiness is the most primitive of the taste sensations, and is a relic from our early sea-inhabiting ancestors, it is a less specialised sensation than the other tastes, more diffuse in its perception, and less easily destroyed. One week later, only twenty days after his injury, the subject had no taste defects.

Taste Blindness

Quite apart from disturbances of the taste sensation that are due to injury to the nervous system and its central connexions in the brain, there is a form of taste blindness which is hereditary, in the same sense that colour blindness is. People are born with defects in their taste sensation and never recover from them. Some changes are known to occur with increasing age in normal people, *e.g.* children are very fond of sweets probably because taste-buds are spread over wider areas in the mouth than is the case with adults. Richter and Campbell[6] found that children were more sensitive than adults to the sweet taste; the sugar-taste threshold of 58 children averaged 0·68 per cent., while that of 52 elderly individuals averaged 1·23 per cent. Taste blindness is independent of age.

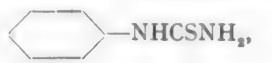
One of the substances which most clearly demonstrates taste blindness is thio-dulcin. Dulcin itself is *p*-ethoxyphenyl urea and is intensely sweet, but thio-dulcin or *p*-ethoxyphenyl thiourea

is very bitter to most people, yet quite tasteless to others. Snyder[7] investigated the subject and found that about 68 per cent. of the people tested thought the substance was bitter, and about 32 per cent. could not taste it. The defect is inherited by offspring from their parents according to Mendel's laws; it is not sex-linked; if neither parent can taste the substance, none of the children can do so.

An investigation by Levine and Anderson[8] has shown that taste blindness varies with race; whereas 30 per cent. to 40 per cent. of whites cannot taste thio-dulcin, only 6 per cent. of individuals among the American Indians are non-tasters.

Phenyl Thiocarbamide

Phenyl thiocarbamide, which has the constitution



is very similar to thio-dulcin. Most people find it very bitter, but there are about 5 per cent. who cannot taste it at all. Fox[9] found that this dual taste reaction was also given by the similar substances *sym*-diphenyl thiocarbamide $C_6H_5NH.CS.NHC_6H_5$ and *asym*-diphenyl thiocarbamide $(C_6H_5)_2N.CS.NH_2$. He considered that the property was independent of age, race, sex, and the *p*H value of the saliva. He suggested that the taste response might be due to differences of solubility of the substance in the subject's saliva, but later work has shown that thioacetamide, which is very readily soluble in water, also exhibits a dual taste reaction, so that it is most unlikely that solubility in the saliva is an important factor in causing differences of taste perception of these phenyl thiocarbamides.

Test for Taste Deficiency

Blakeslee[10] examined 103 families for taste deficiency towards phenyl thiocarbamide and came to the conclusion that the taste blindness was not a real deficiency, but was due to differences in the taste threshold for phenyl thiocarbamide; inasmuch as the substance cannot sometimes be found to taste bitter even in saturated aqueous solution, it is to all intents and purposes a real deficiency. There are, however, gradations in sensitivity to the bitter taste of phenyl thiocarbamide. In a later report Salmon and Blakeslee[11] reported that about 3 per cent. of individuals could not taste phenyl thiocarbamide at all, a number which is very much lower than the proportion of non-tasters for *p*-

ethoxy phenyl thiocarbamide. Salmon and Blakeslee showed that there was a maximum frequency among 93 individuals for the first perception of the bitter taste at 0·000312 per cent., a figure which later work by Richter and Clisby closely confirmed.

Individual Reactions

Richter and Clisby[12] investigated the reactions of individuals to phenyl thiocarbamide in some detail. For testing, each individual was handed two 1 oz. glasses each containing 5 c.c. distilled water, which he was asked to taste. Then he was offered two more glasses, one of which again contained distilled water, whereas the other contained an extremely dilute solution of phenyl thiocarbamide. With each successive trial the concentration of this substance was increased, the relative positions of the water and the solution being varied irregularly between left and right hands. The trials, which were carried out at 22° C. to 26° C., continued either until (*a*) the subject stated that one of the liquids had a bitter taste or (*b*) the concentration of phenyl thiocarbamide in the test solution reached 0·25 per cent., which is its saturation value. At this concentration 13 individuals out of a total of 261, made up of 139 males and 122 females of ages from 17 to 50, failed to recognise a bitter taste, although they objected to the taste. The concentration at which the difference between the two liquids (water and phenyl thocarbamide solution) was first recognised varied from 0·000005 per cent. to 0·1 per cent., with a maximum frequency at 0·0003 per cent. phenyl thiocarbamide, and the bitter taste was first recognised at concentrations varying between 0·00001 per cent. and 0·2 per cent. Out of the 261 subjects, 125 recognised the taste as bitter as soon as they detected it, the other 136 described the taste as follows:

Different	33
Stronger	18
Dry	11
Alum puckering	5
Burning	2
Sweet	15
Salty	5
Sour	17
Iron	2
Other sensations and combinations of above ..	28
	136

All except 13 individuals of the 136 recognised the bitterness of the taste when the concentration of phenyl thiocarbamide was increased. The presence of 13 non-bitter tasters in a group of 261 individuals agrees fairly well with Salmon and Blakeslee's figure of 3 out of 93. As about 5 per cent. of humans scarcely taste phenyl thiocarbamide, which is very toxic, they would presumably take large amounts, if it were offered in food. It is clear, too, from a consideration of the subliminal concentrations, that the change from non-tasters to tasters of phenyl thiocarbamide is gradual and not sudden; there are people who can detect its bitterness in extreme dilutions and there are those who cannot detect its bitterness at all, but there is also every intermediate grade present. This throws quite a new light on the question of taste blindness, which cannot be due to differences in solubility of the substance in the saliva.

Taste Reactions in Rats

Richter and Clisby (*loc. cit.*) extended this work on taste reactions to rats. Experiments consisted of housing rats in cages which contained a food cup and two inverted graduated 100 c.c. bottles; the consumption of liquid from the bottles was recorded daily. For ten days both bottles were filled with distilled water, and it was found that the intake from each was fairly equal and uniform; then one bottle was filled with a very dilute solution of phenyl thiocarbamide, the other still being filled with distilled water. So long as the rats could not taste the phenyl thiocarbamide they continued to take approximately equal quantities of liquid from each bottle. Each day the concentration of phenyl thiocarbamide in the one bottle was increased, and as it was increased, it was found that a point was reached when the rats drank less from it and more from the water bottle. This point was taken as the taste threshold.

The experiments were carried out at a temperature of 24° C. to 26° C. with 47 rats (23 male, 24 female) aged between seventy and 152 days. It was found that at a concentration of 0·0003 per cent. most of the rats began to drink less from the phenyl thiocarbamide bottle, and this, it will be remembered, was the subliminal concentration of maximum frequency for adults. Evidently the perception of rats for phenyl thiocarbamide is similar to that of humans. So it is for salt, and not very greatly different for sugar.

At concentrations much higher than 0·0003 per cent. most of the rats refused the phenyl thiocarbamide solution altogether and drank only from the water bottle. Some rats were much more taste-sensitive than others, and the concentrations at which they refused the solution varied from 0·00005 per cent. to 0·02 per cent. Two rats out of the 47 only refused the phenyl thiocarbamide at this latter high figure, so that presumably about 4 per cent. of the rats were practically taste blind to phenyl thiocarbamide. This again exemplifies the close parallelism of taste in rats to taste in humans.

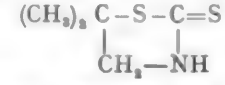
In another series of experiments, no alternative water-bottle was offered, only the phenyl thiocarbamide solution. Most of the rats stopped drinking

at 0·003 per cent. to 0·009 per cent., far beyond the mean threshold value for taste, but nevertheless in such a low concentration that it could hardly have injured them. An intake of 2 mg. phenyl thiocarbamide is usually fatal to a rat, and when phenyl thiocarbamide was mixed with their regular food, most rats ate enough to kill themselves.

Hopkins[18] has taken the question of taste blindness considerably further; he prepared the substance 2-mercapto-5,5-dimethyl-oxazoline, which in its tautomeric form (preferred) is 2–thion–5,5–dimethyl oxazolidine

2-mercapto-5,5-dimethyl-oxazoline | 2–Thion–5,5-dimethyl–oxazolidine

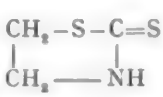
This substance was tasteless to him, but another person (D.C.C.), working in the same laboratory, noticed when he was bottling a small quantity of it that it was intensely bitter. The behaviour of this substance is reminiscent of that of phenyl thiocarbamide $C_6H_5NHCSNH_2$ described by Fox, and indeed of other substances also described by him. Hopkins made several other compounds similar in type to the 2–Thion–5,5-dimethyl oxazolidine. When the oxygen atom in the ring was replaced by sulphur, the compound 2–Thion–5,5-dimethyl thiazolidine also tasted bitter to (D.C.C.) but tasteless to Hopkins (C.Y.H.)



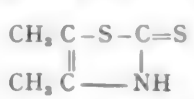
The corresponding monomethyl derivatives also give similar dual reactions. These were

2–Thion–5–methyl-oxazolidine
2–Thion–5–methyl-thiazolidine

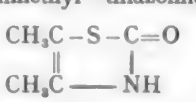
When the methyl substituent group was removed, the product 2–Thion–thiazolidine also gave the dual reaction



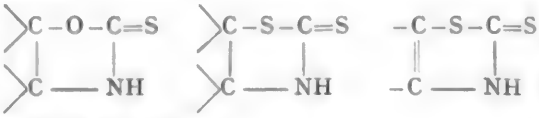
The corresponding 2–Thion–4,5 dimethyl-thiazoline



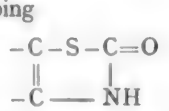
was bitter to some and tasteless to other individuals, but if the thion (mercapto in the tautomeric form) sulphur atom was replaced by oxygen, as in 2–Oxo–4–5 dimethyl–thiazoline



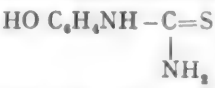
the bitterness disappeared and this substance was tasteless to all subjects. The monomethyl derivative 2–Oxo–4–methyl-thiazoline was also tasteless. Evidently, therefore, the following groupings, with various substituents, gave the dual taste reaction



whereas the grouping



did not. It appears, therefore, that the dual taste reaction is associated with the grouping $-NH-\underset{|}{C}=S$ but not with $-NH-\underset{\|}{C}-S-$. It will be appreciated that the system $-NH-\underset{|}{C}-S$ occurs in *p*-ethoxyphenyl thiourea HO $C_6H_4NHCSNH_2$ or



with which Snyder (*loc. cit.*) worked, and also in phenyl thiocarbamide $C_6H_5NHCSNH_2$ and *sym*-diphenyl thiocarbamide $C_6H_5NHCSNHC_6H_5$ which Fox (*loc. cit.*) found to give a dual taste reaction; also in *asym*-diphenyl thiocarbamide $(C_6H_5)_2NCSNH_2$.

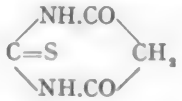
The simplest compound which contains the $-NH-\underset{|}{C}=S$ group is $HCSNH_2$ thioformamide, which has been described by Willstätter as very bitter. Many other substances which contained this group were examined by Hopkins with the following results:

Substance.	*Taste Sensation.*	
	To Non-Tasters, e.g. *C.Y.H.*	*To Tasters,* e.g. *D.C.C.*
Thioacetamide ...	Almost tasteless	Very bitter
Thioacetanilide ...	Tasteless	Very bitter
Isodithiocyanic acid NH CSNHCS	Tasteless	Very bitter
Allyl thiourea ...	Momentary faint bitterness	Very bitter and persistent

As thioacetamide is very soluble in water, it is evident that the differences in taste perception are not due to differences in solubility as might have been thought, perhaps due, for example, to differences in *p*H value of the saliva of different individuals.

All compounds with the $-NH-\underset{|}{C}=S$ group do

not show the dual taste reaction; probably the presence of other groups can overpower its action. Thus thiourea NH_2CSNH_2 is not bitter, but is sour to all persons, and thiobarbituric acid



has a faint but not a bitter taste to all individuals.

Nevertheless, it seems to have been established that those substances known to give dual taste reactions, *i.e.* bitter to some people, tasteless to others, are characterised by the possession of a $-NH-\underset{|}{C}=S$ grouping.

Taste Blindness is Hereditary

It is evident that there is a small proportion of the population that is unable to taste certain substances, which to most appear to be very bitter. In addition, there are many people who are relatively insensitive to such substances. There are, as might be expected by analogy from the incidence of colour blindness, all gradations from sensitivity to non-tasting present in a cross-section of the community. Like colour blindness, taste blindness is a hereditary defect, although one that is unlikely to have untoward consequences.

Rather surprisingly, rats seem to have differences similar to humans in their reaction to phenyl thiocarbamide. It seems strange that in a perception in which differences occur even among humans, there should be almost exact parallelism between humans and rats. The taste blindness, whether partial or complete, is not due to differences of solubility in the saliva of individuals, because although most of the substances which give a dual taste reaction are only slightly soluble in water, at least one substance—thiocarbamide—which does give the dual taste reaction, is readily soluble in water.

It has also been shown that those substances which do give the dual taste reaction are characterised by the possession of the group $-NH-\underset{|}{C}=S$, although all substances which incorporate this group in their structure do not necessarily give the dual taste reaction.

In addition to taste blindness, which is independent of age, sex, etc., other differences in taste reactions are determined by age and association of taste with other mental concepts.

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A Boon for Food Research Workers

THOSE engaged in specialised research are well aware of the enormous volume of published work which it is necessary to read. Present conditions emphasise the need for co-ordination and integration of food research to promote an orderly and systematic development of scientific knowledge in this important field. A recently published first volume of a work* is a partial answer to this need, aimed to provide a medium in which every phase of research in food and human nutrition may be exhaustively and critically reviewed on a continuing basis.

The main items of food research covered are the nutritional requirements of man, the physiological and psychological factors influencing food intake, the incidence of infectious and toxigenic agents in foods, and the effects of the processes through which foods are passed during production, harvesting, or slaughtering, processing, storage, distribution, and utilisation.

In Volume I are included contributions on the ageing of beef, vitamins in canned foods, voluntary food intake, the shelf life of dried eggs, palatability of poultry meat, deterioration of processed potatoes, climate and fertilisers affecting vitamin and mineral content of vegetables, browning of fruit products, food preservatives, and pectins.

That the information given is authoritative is ensured by the high standard of scientific competence of the contributors. Obviously, each contribution bears the imprint of the author's personality and his selective preferences. It is no reflection on the contents that the inferences drawn may not necessarily coincide with the opinions of the expert reader.

Apart from those who are actually working on any of the subjects discussed, this book, and its successors, bid fair to be an inestimable boon to those whose task it is to consult the literature for purposes other than research work.

* *Advances in Food Research*. Vol. I. Editors: E. M. Mrak, University of California; George F. Stewart, Iowa College, New York. Pp. 459+xv. Academic Press, New York. H. K. Lewis and Co., London. Price 41s. 6d.

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White Leghorns on a modern Danish chicken farm.

Egg Production in Denmark

A. L. KIDSON

For the egg user and consumer it is heartening to see the increasing quantities of shell eggs now reaching this country from the "recovery areas" of Europe. Foremost among our oversea suppliers is Denmark, intent on regaining her pre-war status as the world's greatest egg exporter. A notable feature of Danish poultry keeping is the decentralisation of production : the smallest holdings have the largest number of hens and produce in the aggregate the most eggs.

THE Danish egg industry suffered less from the ravages of war than that of most other European countries, though it shared in the shortage of feedingstuffs. The Danish climate, like Great Britain's, is favourable to poultry-keeping, while the general flatness of the country makes it adaptable to the business of fowl-house construction, the layout of runs, and poultry management generally. Nearness to the main market (Britain), and regular shipping services, make it possible to land the Danish product fresh and in good condition.

The Dane has not relied solely on these natural advantages. By scientific breeding he has developed his flocks to produce more and bigger eggs. Today the average annual yield per hen in Denmark is 120; in 1900 it was estimated at 100, and for some years following it ranged between 105 and 110. This selective breeding has been backed by better care and housing for the birds, and the keeping of younger and more productive ones.

Danish Poultry-keeping Practice

Current poultry-keeping practice in Denmark is similar to that followed by the more progressive sections of the British industry. One difference is the Danish preference for a single large building rather than a number of smaller ones. The Danish hen-house usually opens out on several different yards, of which one, in turn, is always kept closed. This is ploughed or dug over during the fallow

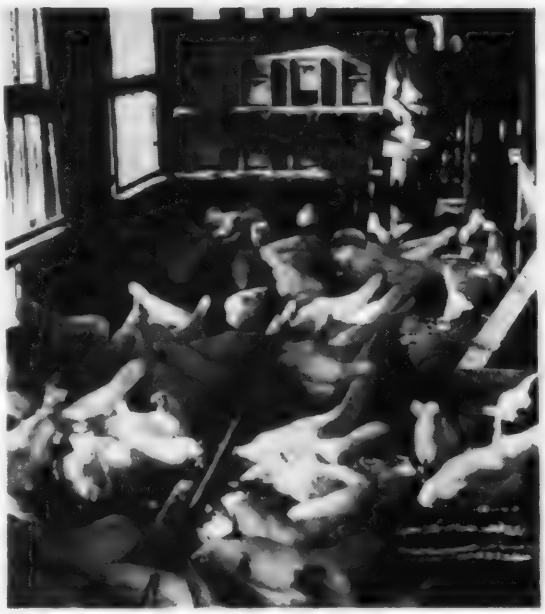
Category of Holding and Area.	*Cottages (0·55-5 ha.).*	*Smallholdings (5-10 ha.).*	*Ordinary Farms (10-60 ha.).*	*Large Farms (60-240 ha.).*	*Estates (Over 240 ha.).*
No. of units	47,788	51,920	100,614	4,003	267
Hectares	136,000	363,000	2,222,000	365,000	88,000
Hens	1,368,000	2,108,000	2,787,000	376,000	34,000
Hens per hectare ..	10·05	5·8	1·2	1·03	0·38

period, and so cleanliness and hygiene are maintained.

Laying boxes are often constructed so that the eggs do not remain in the nests, where they are liable to be fouled, but roll away down an incline into receptacles. This lessens the need for washing and other forms of cleaning, some of which destroy the natural bloom of the egg and may impair its keeping quality through cracking and other means. Most Danish runs have automatic watering devices, while the houses are equipped with electric lighting worked by automatic switches, to lengthen artificially the hen's "working day."

Denmark gives pride of place to the Mediterranean breeds—known in Britain as the White and Brown Leghorns, and in Denmark as "Italians"; but others, such as Wyandottes, Rhode Island Reds, Plymouth Rocks, and, more especially, the Sussex, are much in evidence in all parts of the country. Pure-breds are more generally favoured, and though a good many Danish poultry-keepers still prefer crossbreds, the pure strains are on the increase. Flocks are renewed by the purchase of day-old chicks from approved breeding-centres and hatcheries.

One of the most notable features of Danish poultry-keeping is the decentralisation of production. That is to say, the smallest holdings have the largest number of hens, and produce in the aggregate by far the most eggs. The table gives a clear idea of this, and although the figures are those of 1943, the ratio remains virtually unchanged.



Feeding White Leghorns inside a laying house.

Thus, on the production side, the Danish egg industry, which now holds third place on that country's list of exports, is largely in the hands of smallholders and "sideliners." How, then, has such a "scattered" industry become so important? The answer is organisation, especially in the matters of collection and marketing. Beginning with the formation of egg societies in many parts of the country, the idea grew, until, in 1895, a national association was formed, organised in districts, and based on co-operative principles. In that year began the Danish Farmers' Co-operative Egg Export Association, which has played a major part in raising the quality of Danish eggs, and promoting the industry to the place it holds today.

District poultry-breeding societies were also formed, and in 1912 these became federated as the Society of Danish Poultry Breeders, under Royal patronage. These Societies undertake considerable

Before being packed, the eggs are graded and sorted.

After sorting and stamping, the eggs are packed.

educational work, such as the sponsoring of lectures, study courses, and the publication of a membership journal. They also attend to the distribution of hatching eggs and breeding stock, the establishment of breeding stations, poultry shows, and advisory services. In 1931 the Danish Government formed two Committees under the Ministry of Agriculture—one for poultry-breeding and the other for eggs. The latter specialises in flock competitions, progeny tests at the Favrholm Control Station, and the publication of an official pedigree book. It also carries out much educational and propaganda work for the improvement of egg quality.

Thus the Danish egg producer has become quality-conscious. His own efforts are supported by improved methods of collecting, and by careful attention to grading, candling, and packing at the packing stations, where the work is highly mechanised, and the plant and methods used are kept right up-to-date. The bulk of the produce—but not all—is exported by the Co-operative Association; commercial exporters handle some, while eggs are also exported by some of the co-operative bacon factories, which have their own collection and packing centres.

All, however, come under the very strict laws which control the Danish egg export industry. Exporters are licensed by the Ministry of Agriculture, and their product must be of uniform size. The export of second-grade eggs is forbidden, while the first-grade fresh must be stamped in red with the word "Danish" in an oval. Government control is exercised at all points of production, collection, packing, and transport, and infringements are dealt with by confiscation and fines.

Fresh Fish Storage

A NEW edition of a leaflet,* intended to help owners, skippers, mates, and crews of trawlers or other vessels that catch "white" fish to land their catches in the best possible condition, deals with the general practice of stowage in crushed ice.

The first section explains broadly and simply the scientific basis upon which the practical recommendations rest. Sea-water bacteria are the main agents of spoilage, bringing about the more striking undesirable changes in odour, flavour, and appearance. These bacteria, simple types harmless to man, are present in very considerable numbers on the outer surfaces, including the gills, of the gutted and washed, freshly caught fish, but not in the flesh. At ordinary temperatures, however, these bacteria multiply rapidly and invade the flesh, producing substances responsible for the stale and later the putrid odours and flavours associated with spoiling and spoiled fish, while the external surfaces become covered with dirty-coloured slime and lose their fresh bloom.

Practical recommendations discussed in the second section include chilling by stowage in crushed ice, which, although greatly retarding the activity of the bacteria, and hence spoilage, of the fish, does not stop it. Nevertheless, chilling is the most effective single factor in keeping fish fresh, and the greatest possible care should be taken to see that enough ice is used to chill the fish thoroughly and to keep it chilled until landing.

In addition to controlling temperature, it is important to gut and wash the fish properly and to handle and stow it with great care as soon as possible after catching, avoiding bruising, tearing, or crushing.

There are three appendixes. The first outlines the more important characteristics in the odour, appearance, texture, etc., of fresh and spoiled "white" fish in both raw and cooked states. The second shows diagrammatically how during stowage in ice for periods up to three weeks the changing condition of the fish, as normally observed by the senses, is accompanied by increase in bacterial infection and in undesirable chemical changes in the flesh of the fish. The third appendix is a specimen short code of practice.

* *The Care of the Trawler's Fish.* By G. A. Reay, M.A., B.Sc., and J. H. Shewan, B.Sc., Ph. D. D.S.I.R. Pp. 12. H.M.S.O. Price 4d. net.

TO AUTHORS

FOOD MANUFACTURE is prepared to consider the publication of any books on scientific and technical subjects which authors might care to submit.

Food Plant Design and Automatic Control

LEO WALTER, A.M.I.Mech.E.

Until recently the accepted practice in the design of food plant had been to consider automatic control of pressure, temperature, rate of flow or liquid level as one of the very last steps. More often than not, plant equipment was delivered without any means of automatic control, and it depended on the user whether hand control or automatic control by means of regulators was used. Later it became apparent to the user and designer of food plant that a mere attachment of control instruments had many disadvantages, mainly by producing difficulties in processing due to unsatisfactory control. The modern trend is therefore to work measuring and controlling instruments into the design of food plant at an early stage of development.

INSTRUMENTATION of plant, as it is known today, did not exist when industrial food manufacture was in its infancy. The designer of food equipment for new processes made provision for indispensable measuring instruments, such as pressure gauges, thermometers, or level gauges, but he left incorporation of automatic controllers to the discretion of the plant engineer or works management, including the works chemist. It was no secret that a number of "attached" automatic control instruments were unsuccessful, but gradually, by trial and error methods, and by scientific research, the position improved. It became evident that certain working conditions were more favourable to automatic control than others. The term "controllability of process" has become paramount, and process analysis from the control angle is now applied to existing equipment before attempting to fit controllers.

The approach to control problems for food processing changed gradually from purely empirical application of control to a more scientific method. After it had been realised what controllability means for accurate control, progressive plant designers and instrument engineers worked together right from the start. Their aim has been twofold: to produce a design of food machinery efficient for processing methods, and to reconcile this basic design to maximum controllability. As these two fundamentals often clashed, a sound compromise, based on practical experience, had to be found.

Controllability of Plant Equipment

A simple example will show why it is often necessary to make a compromise when deciding on the layout of plant in view of controllability. A hot water storage tank, heated by a steam coil, has a desired draw-off capacity for the hot water (see Fig. 1). From the process angle, and with regard to space and first cost, the storage volume of the hot water vessel should be kept to a minimum. From the point of view of controllability, however, the duty of an automatic temperature controller becomes the easier the greater the storage volume of the hot water is provided for, or the greater the capacity of the demand side. The greater the heat storage capacity of a heat-exchanging vessel, whether coil-heated tank, calorifier, or steam-jacketed process pan, the better for closeness of control, because the greater storage of BTU's provides a smoothing-out effect.

If it is intended to control steam input automatically the use of instantaneous water heaters with small storage volume is permissible only where working conditions are very steady. Sudden or frequent changes of load of the apparatus would necessitate a rather larger heat capacity (or storage volume) for the heated substance, *i.e.* a storage heater (see Fig. 2).

Heating Surfaces

Another point to be considered in the design of a heat exchanger—for example, a steam-water calorifier—is the supply-side capacity for heat. It is easy to calculate the heating surface of the steam coil, but its diameter and length should be chosen according to the need for close temperature control. It is the job of the designer of the calorifier to accommodate either a shorter coil, having a larger pipe diameter, or a longer coil with smaller

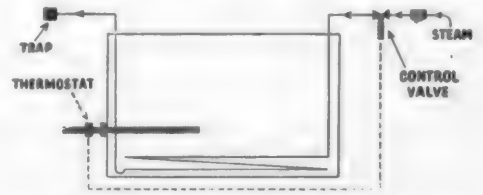


Fig. 1.—Hot water storage tank heated by steam coil.

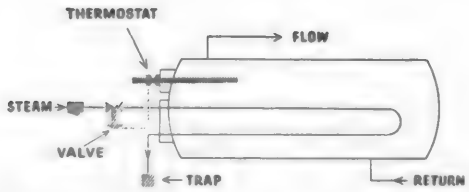


Fig. 2.—Steam control of large liquid vessel. Storage calorifier with U-type steam coil.

pipe diameter at his choice, for producing heat transfer. Both will provide the same heat transfer surface, but each coil will contain a different volume of steam, in other words will have a different supply capacity or stored amount of heat.

The ratio between demand-side capacity (*i.e.* volume of stored hot water) and supply-side capacity (*i.e.* volume of steam content within the coil) is the deciding factor for closeness of control. In other words, if hot water is being drawn off, resulting in a disturbance of heat balance, the intensity of making up for this heat loss depends not only on the heat transfer surface (coil surface), or on the temperature difference between steam and the incoming cold water, but it depends also on the volume of steam, and therefore the amount of BTU's available within the steam coil, whether controllability is favourable or otherwise. Looking at the design of a calorifier entirely from the process angle, it might be quite correct to use a comparatively small storage volume, to dimension steam coils with greater steam velocity, and so on. Unfortunately, "packaged" types of heat exchangers are more difficult to control, and in spite of increased first cost, a compromise must be found between small heater dimensions and better controllability by using a larger vessel, with correctly dimensioned steam coil.

Care must also be taken to provide correct means for inserting the thermostat bulb in the right position, which again influences accuracy of control (see Fig. 3). A heating coil of wider diameter not only provides better controllability, but enables the use of low pressure steam, which in turn increases thermal efficiency of steam-heated plant.

Closer Co-operation Necessary

Closer co-operation between the users of food plant, the designers, and manufacturers of processing equipment on one side and the control expert on the other will ensure the installation of better controllable food plant equipment. The layout of new process installations is now usually worked out in accordance with scientific experience, combining efficiency of processing with accuracy of automatic control. The difficulties arise where an old-established piece of food processing equipment, whether simple or more elaborate, has to be equipped with automatic control instruments.

When attempting to add automatic control to an existing piece of food processing equipment co-operation between process engineer and control expert is important. An automatic controller cannot be bought "off the shelf," and must not be ordered from a catalogue by quoting a number, unless it is an exact repetition of a control problem which has been previously solved. The food process in question must be analysed from the control angle. Makers of control instruments usually provide questionnaires, which must be filled in meticulously by the process engineer, giving all the relevant data, even for the simplest of processes, such as hot water storage tanks or a cooling jacket.

It is often necessary to undertake some experiments with hand control to ascertain process reaction rate, *i.e.* to make sure how the variable to be controlled varies in case of disturbances of balance.

Minor changes in working conditions, which have no practical influence on output or method of processing, often improve controllability. Sometimes certain changes in design of a new apparatus can increase controllability to a great extent, without in any way influencing efficiency of food processing equipment. Addition or reduction of heating surface, or its re-allocation, might greatly increase controllability of food processing equipment and make the use of simpler controller types possible. Smoothing out of fluctuating external process characteristics—for example, regulation of pressure of steam supply for heating, boiling, or evaporating by means of a pressure regulator—might easily improve controllability of a steam-heated apparatus, which formerly had to put up with variations of heat supply, which are detrimental to output, to uniformity of goods, and to accuracy of control.

Accuracy of Control

Exaggerated claims for accuracy of control may lead unnecessarily to more elaborate controller types, which in turn involve higher first cost, more maintenance, and responsibility. As an example, a reputable firm in the chemical industry intended to instal temperature controllers, and in the usual way approached manufacturers of control instru-

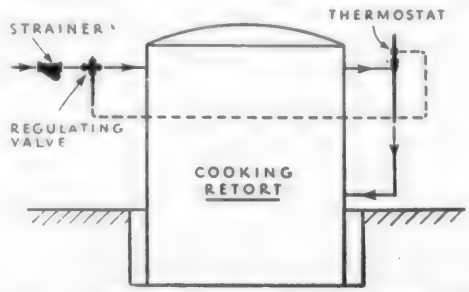


Fig. 3.—Position of thermostat bulb in steam circulation pipe of cooking retort.

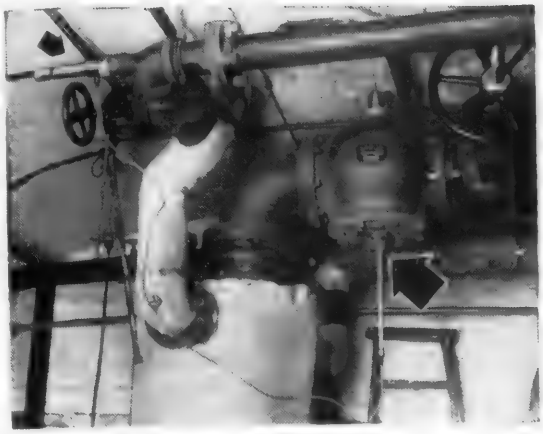


Fig. 4.—Temperature control valve of large vertical non-storage heater.

ments. The potential user gave a few but not sufficient basic data, and stipulated a closeness of control of ± ½° F. At first sight this might have been within reach of a reset-rate controller, but to make sure, a survey on the spot had to be made. This disclosed that the batch process went on for four days and nights without interruption. The accuracy achieved with hand control never surpassed ± 5° F., due to the nature of equipment and of working conditions in general. Nevertheless, the quality and uniformity of the product seemed satisfactory, and the consumption of steam for heating not excessive during the long holding period of temperature.

The reason why automatic control had been considered was to save labour by reducing the number of men on night shifts. Asked why the processing department wanted a closeness of control of ± ½° F., the works chemist could only reply that he thought that if they had to get automatic control, they should just as well have it properly. The result of closer investigation on the part of the control expert and tests by hand control revealed that controllability of the somewhat antiquated plant equipment did not allow more than reduction of temperature deviation from ± 5° F. with hand control to ± 3° F. with automatic control, and after explanation regarding plant controllability this was accepted. Very straightforward temperature regulators of the self-acting type were installed and gave full satisfaction.

Bad Control

The other extreme can also be found in practice. The control expert is sometimes called in to investigate a process having "bad control." After a short survey it becomes obvious that process characteristics definitely call for a higher class reset type controller, or maybe even for a reset-rate (second derivative) controller in place of the simple on/off type already installed. Hunting of controllers can sometimes be found, which developed suddenly, after the control instrument has worked for a long time without trouble. The reason for this was found to be the installation of a new apparatus in an adjacent room, connected to the same steam main, and periodic steam starvation caused disturbances of heat supply, which the existing controller could not cope with. If means of readjustment had been available on the existing controller type sufficiently efficient to cure the trouble, the fluctuations of steam supply pressure would have been smoothed out by adjusting the operating differential.

Summary

The conclusions to be drawn by the process engineer and management of food factories can be summarised as follows:

1. Before attempting fitting of automatic control instruments on existing food processing plant, its controllability must be first ascertained.

2. It pays to increase controllability of existing food processing equipment by minor alterations of plant rather than by using more elaborate controller types. The latter must be used, however, where very close control is required.

3. Exaggerated claims for accuracy of control

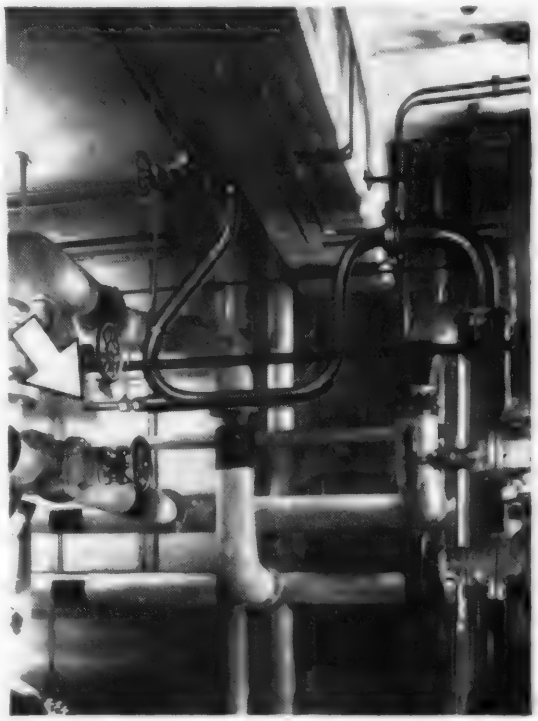


Fig. 5.—Insertion of thermostat bulb in a swan neck of outflow pipe from liquid-filled vessel to keep bulb always fully immersed.

should be avoided, and must take into account controllability of the processing equipment.

4. When ordering new processing plant, controllability of the whole plant, and of each individual piece of plant equipment must be carefully considered. This applies especially where "engineered control" is required, such as in the case of control of several process variables—for example, temperature and pressure in retorts, or for combined heating and cooling as with chocolate enrobers.

5. The design of new equipment "made to measure" must be carefully checked as to best possible controllability. For example, the shape and volume content of a jacketed food processing vessel, such as a boiling pan, a chocolate conche, a water-jacket of a cooling tank, can easily be altered during the first stage of design for improved controllability. The use of an efficient air-operated steam pressure controller in place of an ordinary steam reducing valve may make all the difference for good or bad controllability of steam-heated process equipment in the whole factory.

Although plant layout and working conditions have to be considered in the first instance from the food processing angle to give maximum output at minimum cost, controllability must not be overlooked; it is the main factor for production of uniform goods of highest quality, fully independent of the vagaries of the human element.

Automatic control cannot cure bad plant layout or improve bad working conditions. Properly applied to food processing plant having good controllability, installation of automatic controllers for temperature, pressure, liquid level, rate of flow, etc., will produce top efficiency of processing and maintain it throughout the year.

The British Pharmacopoeia

THE publication of a new edition of *The British Pharmacopoeia** must always be an event, even to chemists and manufacturers in the food industry. On page 2 there is a statement that "the standards of purity and strength of the *Pharmacopoeia* apply to articles which are intended for medicinal use but not necessarily to articles which may be sold under the same name for other purposes." Some food manufacturers might, therefore, be inclined to think there is no need to worry any further about the *Pharmacopoeia*, but they would quite frequently find themselves mistaken. Some forty years ago the work was not taken very seriously by industry, and when colour reactions were first introduced in pathological tests a considerable amount of ridicule was thrown at them by the old-fashioned chemist. The situation is now changed, and if a substance occurs in the *British Pharmacopoeia* the B.P. requirements are generally used as an indication of standard for food purposes as well as for medicinal ones.

Authoritative Information

Early issues of the work would appear to have suffered too much from the influence of very distinguished men who either did not consult those with greater practical knowledge or, if they did, did not give them due credit by acknowledging or using such help. In the introduction to the new edition, acknowledgments are paid to about a hundred people, mostly chemists or pharmacists whose names include the leading members of the scientific staffs of large pharmaceutical or chemical manufacturers. It may, therefore, be fairly claimed that any information given about individual substances or preparations has been approved by the best manufacturers, and that it is, in consequence, a fairly reliable authority on any matter of dispute, even though the subject in hand may not be medical or pharmaceutical.

Monographs in the Pharmacopoeia

It may not be out of place to notice some of the things in the *Pharmacopoeia* to which monographs are devoted: capsicums, cardamoms, caraways, cloves, and cinnamon as examples of spices; aniseed, bitter almond, caraway, clove, lemon, nutmeg, peppermint, almond, arachis, olive, and sesame as oils; cocoa butter; tragacanth, and acacia as gums; sucrose, dextrose, and lactose among sugars; maize, potato, rice, and wheat among the starches, and glycerin. In the case of many chemicals, such as acetic, citric, and tartaric acids, disodium and sodium acid phosphate, sodium and potassium acid tartrates, sodium bicarbonates, etc., there are given standards to which they must conform, and it is not always against the interests of the food manufacturer to be able to quote the *British Pharmacopoeia* in support of quality. The case of soft drinks may be instanced; when complaints were made about the presence of lead, it was pointed out that the quantities about which the complaints were being made could be derived quite easily from citric acid of B.P. quality. While the B.P., 1932, allowed 20 parts per million of lead in citric acid, this has now been cut down to 10 parts in the new one.

* *The British Pharmacopoeia 1948*. Published under the direction of the British Medical Council. Pp. 914+ xl. Constable and Co. Price 45s.

In some ways the reviewer feels that the appendixes are even more valuable to the works chemist than the monographs on substances. Appendix I devotes 66 pages to the materials and solutions used in carrying out the analytical tests required.

Chemical Standards

Some chemical manufacturers have issued books giving standards for their individual chemicals, but here we have what is virtually a small book giving definite standards, while another 140 pages describe the methods of carrying out various other tests, and of these about half are very useful to the works chemist. In any kind of dispute regarding the quality of a product it is always desirable that both parties can agree on a method of analysis. Naturally there is not always universal agreement about official methods, and there has been some considerable discussion regarding the wisdom of adopting the "weight per millilitre at 20° C." instead of "specific gravity at 15·5° C.," except in the case of alcoholic preparations, where the old usage is retained owing to the demands of the Excise Authorities.

To the layman it is rather puzzling to have to think about well-known dyes such as Brilliant Green as *Viride Nitens*, but one easily becomes accustomed to these names and, in any case, the index gives a reference to any substance under English names.

It would be possible, of course, to spend a considerable amount of time discussing those aspects of the book which are not of direct interest to the food manufacturer. The Pharmaceutical Society devoted some seven evening meetings to its review, but it should be emphasised that the Pharmacopoeia Commission have made every effort to be broad-minded and also to be courageous. Instances of such courage are the introduction of tablets of carbromal in the Seventh Supplement to the last edition and their omission in the present one.

Future Volumes

Finally, the reviewer cannot refrain from disclosing a dream of the future. Would it not be useful if all more or less valuable books of this type were made to a standard size with every monograph on a separate sheet of standardised loose leaf paper, so that the user could extract the necessary sheets from different volumes dealing with particular substances and place them together in his own loose leaf file? Would such a system lead to the loss of many valuable documents, which could easily be replaceable by purchase? Would it bring too much copying and infringement of copyright into view, or would it produce chaos by showing how various authorities can put forward entirely different views on the same subject?—T. McL.

Research at Rothamsted

In his introduction to the 1947 Report of the Rothamsted Experimental Station at Harpenden, the Director, Sir William Ogg, M.A., B.Sc., B.Sc. (Agric.), Ph.D., outlines the work carried out by the different departments of the station. Preliminary tests with an experimental fertiliser seed drill gave promising results with sugar beet, mangolds, swedes, and peas; potatoes were also the subject of experimental work, and field trials have shown that broadcasting fertilisers before ridging is much less efficient than applying them after ridging.

The Insecticides Department has continued work on the stomach poison effect of a number of insecticides, and collaborative work on methods of estimation of the pyrethrins has also been continued. In addition to chemical studies a great many physico-chemical and biochemical studies were carried out.

Special reviews included in this report are "The Electric Charge on Soil Particles," by R. K. Schofield, and a review of work on potato virus diseases.

Provender Milling

Written as a series of lectures rather than as a textbook, a recently published volume* will be of use to students of provender milling as a companion to their practical work in the mill. Useful features are the tables on p. 138 and the remarks on elevator capacity; the dangers of "holding-up" in a bin and of sweating are briefly dealt with and the importance of mixing is adequately stressed, with the valuable, and often overlooked, emphasis that "it is uneconomic to adopt standards higher than the product calls for." A comparison of extrusion and moulding cubing machines, included in the chapter on "Cubing," in which the really practical aspect of the subject is discussed, will be of particular interest to the student. To quote the authors: "It is only by working as a cubing machine operative that the full significance of cooking conditions can be realised, which is not quite the same thing as saying that every cubing machine operator does possess this understanding."

On the subject of grain driers, more space is given to large mill driers and conditioners than to farm driers, although the differences in working temperatures of these two types of machine are pointed out.

The illustrations and descriptions of the many types of machines and their working should also prove of practical use to the student of provender milling.—C. W. H.

* *Seed Crushing, Compound and Provender Milling.* Vol. II. By H. Moore and A. S. Moore, A.M.I.Mech.E. Pp. 238. Illustrated. Northern Publishing Co. Price 10s. net.

The Refining of Peppermint Oil

A continuous fractionating still, the only one of its kind in the world used to refine peppermint oil, has been placed in operation at Chehalis, Wash., U.S.A., by I. P. Callisons and Sons. The 58 ft. high piece of equipment rectifies the natural peppermint oil to remove undesirable characteristics and to meet the exacting requirements of the manufacturers of sweets and other products.

SEPARATION of intermediate fractions, hitherto impossible except in the laboratory, is accomplished for the first time with a continuous fractionating still, which combines the flexibility and scope of the laboratory with the efficiency and economy of large-scale commercial rectifying units. Use of relatively low temperatures avoids thermal decomposition and retains the natural flavour and odour of the peppermint oil.

With a daily capacity of more than 2,400 lb. of oil, this equipment replaces the much smaller pot stills used by the company.

Peppermint-growing Areas

The Pacific North-West has become the greatest peppermint-growing area in the world, a distinction once held by England and more recently by the states of Michigan and Indiana. Acreage under peppermint cultivation in the Pacific North-West states of Washington and Oregon is not as great as in Michigan and Indiana, but total production is higher because of higher yields, which reach 50 lb. of oil per acre, compared with less than 35 lb. in the two Mid-West states.

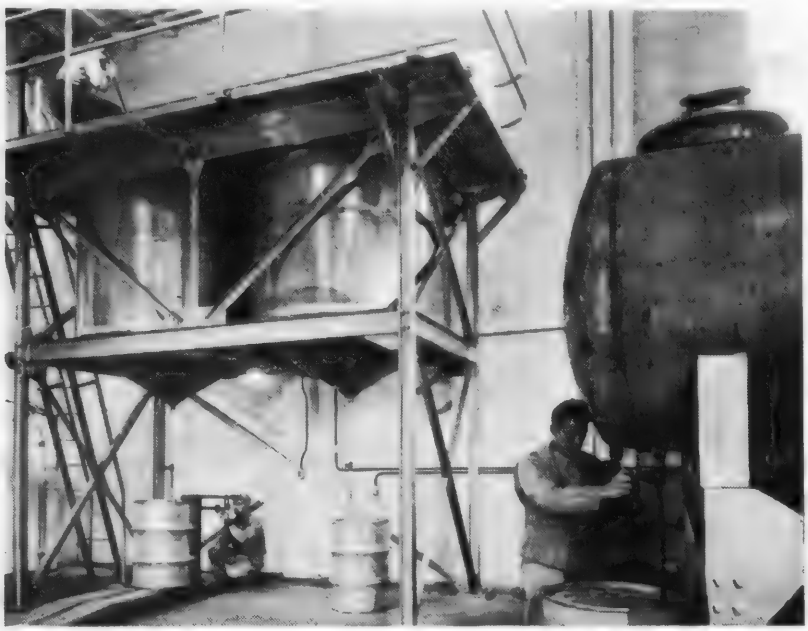
The higher yields in the Pacific North-West are due to freedom from plant diseases, the temperate climate, and an abundant water supply. The peppermint (*mentha piperia*) grows from roots or plants, perennially, to a height of as much as 4 feet, maturing in Eastern Washington in early August and about two weeks later on the West Coast. It was once thought the plant grew best in dirty soil, but this theory has been discarded and soils are the same as required by vegetable crops.

Cultivation Problems

The biggest problem in cultivation is weeding, an important factor because weeds affect the flavour of the oil. Some growers have found that sheep eat the weeds, avoiding the peppermint, but hand weeding must be resorted to before the crop is ready for harvesting.

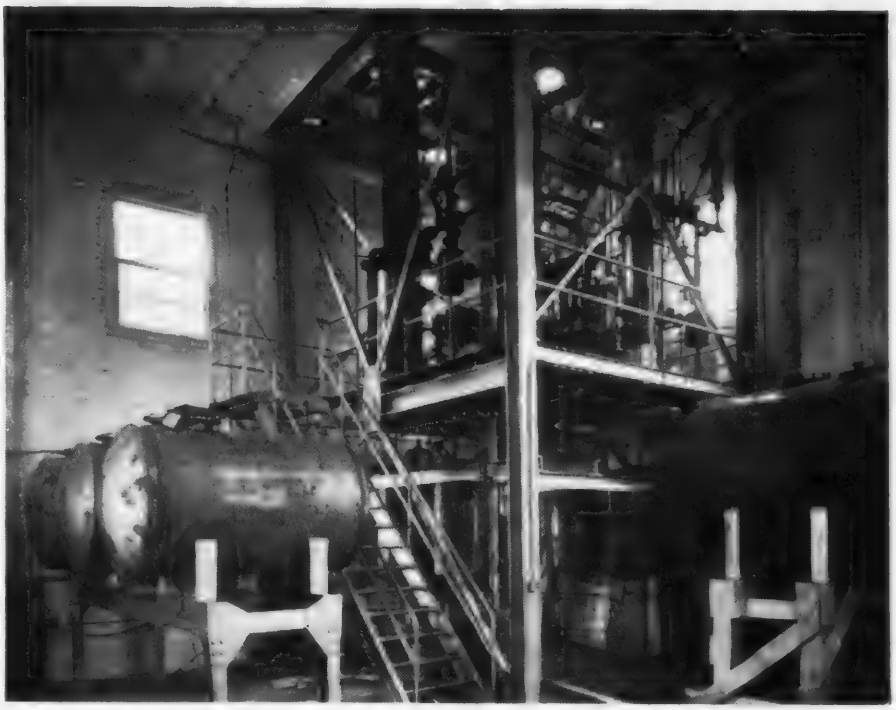
The farms range in size from five to 600 acres. Small farmers have their mint hay custom-distilled, while larger farms have their own stills, with at least twenty-five acres required for the economic operation of the smallest type of still.

When the crop matures, it is cut like hay and allowed to wilt in the field until it loses about 30 per cent. of its moisture, usually in one to four days. It is then picked up by hay loaders or pitched on a truck and transported to the still, or "tub," which usually holds about 1½ tons of hay.



Blending tanks on the left and finished product storage tanks on the right.

These tubs are usually round, 8 feet in diameter at the top and 7½ feet at the bottom, and 8 feet high. As they are filled, the farmer tramples the peppermint leaves to compress them. The filled tub is covered and moist steam, supplied by an oil-fired boiler of about 100 h.p., is introduced at the bottom through a perforated pipe. The steam filters up through the leaves, volatilising the peppermint oil, which escapes with the steam through a pipe at the top leading to a condenser and thence to a decanter, where the oil rises to the top and is periodically drawn up. Some 2 to 3 tons of hay will produce 50 lb. of oil.



Above: **View of the first two stories of the four-story fractionating still.** *Below:* **Control panel at the base of the columns.**

The farmer stores the oil in 50 gal. galvanised metal drums owned by the company. During the peak of the season the company's trucks operate a daily service in some areas to pick up the full drums. In other parts of the Pacific North-West field men send the full drums in to the local receiving station or sometimes the farmers ship their oil in by commercial truckers.

Taste and Odour Tests

Attached to each drum is a placard which bears the name of the grower and, because peppermint from each area has a distinctive flavour, the name of the growing region. As each drum is received at the plant, its contents are analysed in the laboratory for esters, menthol, etc., and examined for taste and odour.

Taste is graded in four classifications after sampling by five persons, using sugar fondant as a base. These classifications are good and bland, good and sharp, medium, and poor. Odour is classified as sharp, bland, medium, or poor.

Information as to taste and odour is transcribed on the placard while data on the chemical analysis are filed in the laboratory. The drum is then stored at 45° F. until needed.

Oils are selected which will best fit the particular requirements of the manufacturer. The natural oil, still in drums, is taken by hand truck to the still and pumped into stainless steel blending tanks. The empty drums are cleaned with steam and with solvent when necessary before being reused.

Post-blending Operation

After blending the oil is pumped into a 1,500 gal. tin-lined copper holding tank at the bottom of the still. Another pump sends the oil into Column No. 1, or heads column, the flow being registered and controlled through Flo-rators on the central panel at the base of the columns.

The heads column, as well as the adjacent products column, has a number of horizontal bubble-cap plates spaced at intervals of 1 feet. It is of tin-lined copper construction, as are the ½ in. to 4 in. pipes used in the still. Steam at low pressure is introduced near the bottom and escapes at the top, losing part of its heat on the way. The oil enters the column on one of the middle plates.

The lighter, lower-boiling fractions found in peppermint oil rise to the top as vapours with the steam, pass into a condenser, and thence to a reflux decanter, where the oil rises to the top and drains off through a weir back into the column while the water goes through a baffle plate rising from near the bottom of the decanter. The water is piped off into a stripper, where the remaining oil is boiled off, goes through a condenser, and is returned to the heads column.

Treatment of Other Fractions

The medium and high boiling fractions are drawn up by a pump into the products column, where steam is again introduced at a slightly higher temperature. The process is repeated here, the remaining light oils rising as vapour into the condenser and then to the decanter, with the water going to the stripper and the recovered oil returning to the heads column. The finished oil is drawn off one of the upper pasteurising plates, decanted to separate the oil from the water, and piped into stainless steel storage tanks. The bottom oils from the products column are drained off as tars, or waste, aggregating about 2 per cent. to 4 per cent. of the total weight.

The most important single advantage of this type of still is its capacity for concentrating and isolating certain minute fractions of the oil. This is possible only because of an almost fantastically high reflux ratio that can be maintained without impairing the efficiency of the still. These fractions are bled off into a series of small holding tanks. Some of these fractions are objectionable and have no value while others are salvaged for use in compounds.

From the finished product storage tanks the oil is pumped into the blending tanks and then through a 15,000 r.p.m. centrifuge, which removes the remaining excess moisture and solids. From the centrifuge the oil is drained off into drums and is ready for shipment.

Ultrasonics Research

EXPERIMENTS on the possible uses of ultrasonics are being carried out at the U.S. Department of Agriculture Research Centre at Beltsville, Maryland.

Only limited investigations have been undertaken so far, and further research is recommended into the biological effects of ultrasonics on plant and animal materials, bacterial control, sterilisation or pasteurisation of milk and other food products, homogenisation of milk, emulsification and near dispersion in liquids, coagulation of particles suspended in fluids, control of insects and diseases, and production of mutations in grains, bulbs, or other plant materials.

Tests in which mosquito larvae were killed within five seconds showed the percentage of mortality of the larvae to be directly correlated with the amplitude of the waves and, within limits of the experiment, the percentages did not differ significantly with length of exposure.

Under similar conditions larvae of the codling moth required exposures of up to a full minute for killing, but when they were imbedded in fruit these larvae apparently were undisturbed.

Other preliminary tests showed decreasing vitamin C content in orange juice exposed to the treatment, the decrease depending on the time of exposure, and that particles of DDT could be reduced by ultrasonic vibration to sizes smaller than have hitherto been possible.

Fundamental studies yet to be undertaken, according to the Department of Agriculture investigators, necessarily must be aimed at evaluations of frequencies and combinations of frequencies, intensities of wave propagation, radio frequency, electromagnetic and electrostatic field effects, heat developed in various products through ultrasonic treatment, length of exposures, and technique of applying ultrasonics.

Two Sugar Producing Palms

R. D. CHANDLER, M.P.S., A.R.I.C.
Travancore, S. India.

Sugar is a common naturally occurring substance in most parts of the world, and apart from the sugar cane and beet, the coconut and palmyra palms are also sources of supply, the palmyra in particular supplying fairly large quantities which form an important part of the diet in such parts as Southern India, where the inhabitants take it in its natural form of jaggery.

PRACTICALLY no part of the palm tree is wasted, which is true of many other tropical trees also found in Southern India. The coconut palm has many uses, its leaves being used for thatching huts. Coir is obtained from the fibrous part of the fruit from which rope and matting are made. The soft inner portion is an ingredient of confectionery and coconut oil is also one of its products. The hard shell is used in making kitchen utensils and the finest charcoal. The hard and fibrous stem of the palm is made into rafters and pillars. Sugar is obtained from the sap contained in the flowering stalks; the juice when collected is better known as toddy.

The uses of the palmyra palm are not generally so well known. Its stem is used for building and is just as fibrous and strong as that of the coconut palm. The leaves are fan-shaped, and have uses similar to those of the coconut; they are also made into sun hats, worn by the coolies in the south of India. The fruits are very different from the coconut, the fleshy portion being coarse and in older fruits fibrous, although even these are eaten to some extent on account of the sweet juice they contain. The palmyra is used for toddy production; it is better known for this purpose than is the coconut. Even the young roots of the palmyra are used as food.

Coconut palm (*Cocas nucifera L.*) and palmyra palm (*Borassus flabellifer* [Linn.]) are common throughout Southern India. Some regions of Travancore are famous for the palmyra, while others are similarly noteworthy because of the huge areas given over to coconut palms.

In the production of sugar from the coconut and palmyra palms the flowering shoots are subjected to the necessary preliminary manipulation and then incised. The juice, which is sweet, flows out fairly rapidly and contains a high percentage of sugar as sucrose. If the juice is allowed to remain for a short while in the collecting pots, which have not been previously treated with lime, it ferments, and the resulting liquid is known as fermented toddy, which is an alcoholic beverage and, although somewhat discouraged, is still taken in quantity by the local inhabitants. The liquor is potent, and if prepared under clean conditions, when it may be taken with safety, it has a pleasant taste.

Tapping and Toddy Production

In the cases of both the coconut and palmyra palms, it is the flower-bearing stalks which are utilised for the production of toddy. When both trees reach the flowering stage, that is from twelve to fifteen years after planting, they are ready for tapping. The latter word is used in each case, but with coconuts the flower-bearing stalk is actually tapped with a small wooden stick, hence the word

A and B illustrate the male and female flowering shoots respectively of the palmyra palm; C shows the fruits and D illustrates jaggery and the specially shaped container in which it is moulded.

is very descriptive in this particular case. This is controversial, and some say that the palmyra is also tapped.

The flowering stalk of the coconut is gently and evenly tapped while it is still within its sheath; better results are obtained when the flowering branches are close together than when they have become bush-like. This process is continued at dawn and at dusk for five or six days. Tapping makes the stem tender and breaks up or softens the sap-carrying vessels. The flower stalk is then cut off, and the toddy allowed to drip from the incised end into lime-coated pots. There is always some invert sugar present in the toddy, and some fermentation takes place. To facilitate flow of toddy a small portion of the stalk is cut daily.

Beating and Crushing Operation

The operation of beating and crushing the palmyra takes place on three successive mornings, and on each of the four following a thin slice is cut from the flower shoots to encourage the flow of sap and to prevent the buds from bursting. Toddy begins to flow on the eighth morning. The stalks of both the female and the male flowers are incised, but the female only produces half as much sap as the male. A rather primitive type of squeezer, comprised of two pieces of wood hinged at one end and made to operate like nut crackers, is used in squeezing the stalk to break the walls of the vessels and facilitate excretion of the juice, which is merely another form of toddy. This is collected in exactly the same manner, unless it is required as an alcoholic liquor, when in both cases it is collected in untreated jars and left on the trees until fermentation is complete.

In both cases the flowering stalks must be allowed to become sufficiently strong to withstand the treatment. Each day a further portion of the stalk is cut off and more juice collected. There are seldom more than three spadices yielding toddy on a coconut, but there are usually seven or eight on the palmyra. The yield of the palmyra is about three or four quarts a day.

Jaggery Manufacture

As previously mentioned, in parts of Travancore toddy tapping has become a relatively large cottage industry, and the palmyra palm is used chiefly for this purpose. It is highly specialised work, and the men who carry on this industry have usually spent their whole lives in it, commencing at a young age. Almost all householders have small plots which include a few of these trees. It is a valuable source of food and beverage for those who like it, but it is mainly used as a sweetening agent, and is sold in the markets as jaggery, which is the concentrated form and is solid, often being contained in halves of coconut shells.

Sweet toddy is boiled until syrupy and poured into pots to set. Three quarts of toddy produce 1 lb. of jaggery, and this is the material which is bought up by sugar refineries in southern India to be refined and sent out to the markets as granulated sugar. In taste this sugar is much the same as that of cane sugar, but in appearance it is somewhat darker in colour. Jaggery as obtained in the market is rust-coloured, and has a distinct saccharriferous odour.

Since jaggery is purchased from the markets for sugar manufacture, it is essential that some standards are formed for the purpose of purchasing.

It contains approximately 76 per cent. by weight of sucrose, 3 per cent. to 4 per cent. of reducing sugars, and 7 per cent. to 8 per cent. of moisture.

Good samples usually provide an ash of from 2 per cent. to 3 per cent., and figures for the insoluble matter are usually from 4 per cent. to 6 per cent.

These figures usually convey some idea as to whether samples are genuine or not.

The jaggery seasons vary in different parts of southern India, and are entirely dependent upon the rainy seasons. In recent years it has been difficult to make a definite statement respecting this because the rains often come when there should be bright sunshine, and *vice versa*. In Travancore the season usually commences in September or October, reaches its peak in January and February, and gradually fades out in April, but in the Tinnevelly district the season starts in February and reaches maximum production in April, May, and June.

Colour in Tomato Products

SUITABLE objective methods for measuring the colour of processed food products, with special emphasis on tomato products, were the subject of a paper presented at a recent meeting of the American Chemical Society. The paper described the development of a new colour index made by a simple extraction of the pigments with acetone, and reading the values on a suitable colorimeter.

The results of comparing the colour index with the quantity of pigments determined by the binary method of Zscheile and by the chromatographic and colorimetric methods were given for samples of tomato juice and tomato pastes prepared from these juices. Approximately 91 per cent. to 96 per cent. of the pigment soluble in acetone was found to be from the lycopene fraction. A good correlation coefficient was obtained when the colour index was correlated with the quantity of either total carotenes or the lycopene fraction using the three methods of analysis on two varieties of tomatoes.

Proteins in Nutrition

A VOLUME* dealing with special aspects of nutrition consists of a symposium to which have contributed authors who are authorities on their subjects.

This book is not a report on research; it does not open new avenues of thought—it is a compilation. Within this limit it is comprehensive and of considerable value. The facts gleaned from its perusal are of great interest. Protein food is a vital part of nutriment, without which animal life could not be sustained. The method of ascertaining the protein requirement of the individual is to find out whether the intake of this food balances the output.

It is possible to obtain a balance on 1½ oz. protein per day and even less. Equally a balance is obtainable by an intake of four times or more of this amount. The question is: Which is the optimum requirement—the greater or the lesser intake?

The writer of the section dealing with this aspect kept a number of patients suffering from high blood pressure under observation for many years on a very low protein intake, and they apparently did very well. But in these instances the subjects were all middle-aged people. The reviewer's experiments, however, proved conclusively that the growing individual should not be subjected to protein restrictions. The food situation so far as first-class protein is concerned is as bad now as it has been for several years, and nobody knows when the situation will become easier. The incidence of tuberculosis—a disease which mostly attacks the young—and other evidence suggest that the rising generation does not obtain the amount of protein it really needs. The protein available for people under thirty years of age should be definitely much greater than the rations of the middle-aged and elderly. Such an arrangement, if in any way possible, would be in the interest of the young as well as of persons of more mature years.

Still another set of facts of great importance is presented in this book. It is clear that the old Malthusian thesis, according to which the population tends to increase in greater ratio than the food, still holds good. Those who believe it is possible, under proper arrangement, to provide all the necessary food for all peoples of the world have not grasped the problem at all. In the nature of things the food supply is limited, and the nations of the world must compete for the limited supply. It is in these circumstances that Darwin's natural selection law comes in, which in the human species does not so much operate on the individual as on the nations as a whole. It is this fact which must act as a stumbling block in the path of any kind of a league of nations. In the long run only the fittest nation can obtain sufficient nutriment to multiply and become dominant; and it will have to fight for it. One day it is probable that protein will be produced synthetically, but even then the Malthusian and Darwinian laws will prevail.

Here are some striking extracts from the book:

"Increasing the extraction of flour in wheat milling increases the protein content and the biological value of the protein, but decreases protein digestibility. The net result is an increase of about 10 per cent. in net protein value of the bread. The addition of 6 per cent. of milk solids to white bread raises the biological value of the protein by 5 percentage units, depresses the digestibility by 2 units, but increases the net protein value by some 25 per cent. because of the concomitant increase in protein content."

"Lusk calculated that the calories were increased from 53 to 95 when the music of Mendelssohn was performed and to 128 when the *Appassionata* of Beethoven was played."

"The purchase of a given quantity of plant protein in the form of common staple food items usually entails less cost to the consumer than the purchase of an equal quantity of animal protein in such forms as milk, cheese, eggs, or meat."

"It comes as something of a surprise to many people to learn that so little of the world's food production moves in intercontinental trade—only about 6 per cent. of total production. Of the six continents, Europe is the only one which imports more food than she exports—her imports of food total about 25 per cent. as much as she produces."

"It is estimated that there is available the equivalent of about 1·0 to 1·5 acres of reasonably productive land per person."

This book contains chapters on Proteins in Nutrition; The Biological Utilisation of Proteins and Protein Requirements; Caloric, Vitamin, and Mineral Requirements, with Particular Reference to Protein Nutrition; Economic Aspects of Food Proteins; The Nutritive Aspects of Meat and Meat Products; The Amino Acid Requirements of Avian Species; The Relation of Hormones to Protein Metabolism; Plasma Proteins and their Relation to Nutrition; Protein Deficiency and its Relationship to Nutritional Anaemia, Hypoproteinaemia, Nutritional Oedema, and Resistance to Infection; Protein and Amino Acid Nutrition in Pediatrics and in Pregnancy; Protein Nutrition in Surgical Patients; The Relation of Fluid and Mineral Balance to Protein Metabolism; Proteins as related to Burns; The Protein Nature of Toxins, Antitoxins, and Related Substances; and Protein Nature of Filtrable Viruses.—I. H.

* *Proteins and Amino Acids in Nutrition.* Edited by Melville Sahyun, M.A., Ph.D. Pp. 566+xvi. Reinhold Publishing Corporation, U.S.A., Chapman and Hall, London. Price 45s. net.

News from the Industry

FORTHCOMING EVENTS

First Packaging Exhibition

Sponsored by the Institute of Packaging, the first British National Packaging Exhibition will be opened in the City Hall, Manchester, on October 5.

*

Royal Institute of Chemistry

The following visits are included in the summer programme of the London and South-Eastern Counties Section of the Royal Institute of Chemistry:

June 8. Afternoon visit to Bevans Cement Works (Associated Portland Cement Manufacturers, Ltd.), Northfleet, Kent.

June 15. 2.15 p.m.: visit to Pharmaceutical Specialities (May and Baker), Ltd., Dagenham, Essex.

June 21. 2.15 p.m.: visit to R. and A. Kohnstamm, Ltd., Randak Tanney, Beckenham, Kent.

June 23. 1.45 p.m.: visit to Kodak, Ltd., Wealdstone Harrow, Middlesex.

June 30. 8.55 a.m. St. Pancras (10.21 a.m. Kettering): visit to Stewarts and Lloyds, Ltd., Steel Works, Corby, Northants.

July 8. 2.30 p.m.: visit to Printing, Packaging, and Allied Trades Research Association, Leatherhead, Surrey.

July 15. 1.45 p.m.: visit to Royal Mint, Tower Hill, E.C.3.

July 16. All day social outing to Hastings.

July 20. 2.30 p.m.: visit to Teneplas, Ltd., Insulators, Upper Basildon, Berks.

July 26. 2.15 p.m.: visit to Carreras, Ltd., Hampstead Road, N.W.1.

Aug. 9. 8.20 a.m. Liverpool Street (12.10 p.m. Hunstanton): visit to Yardley and Co., Ltd., Lavender Fields and Distilleries, nr. Hunstanton, Norfolk.

*

Fermentation Industries Symposium

Arranged by the Scottish Sections of the Royal Institute of Chemistry as part of a general programme of scientific courses, conferences, and symposia, a symposium on "Recent Advances in the Fermentation Industries" is to be held at the University of St. Andrews from July 23 to 30. The subjects of potable fermentation products, industrial fermentation, and mould metabolic products and methods of assay will be dealt with, and there will also be a lecture on panary fermentation. Two lectures, each followed by a short discussion, will take place each morning. A third lecture and discussion will be held in the early part of each evening. Those attending the symposium will be accommodated in the students' residences, and lectures will take place in the University lecture rooms.

*

Official Opening of Research Station

The official opening ceremony at the Chorleywood Research Station of the British Baking Industries Research Association will be performed by H.R.H. the Duchess of Kent at 3.30 p.m. on Tuesday, June 28.

In view of the relatively short time available for inspection on that day and the limited amount of space in the laboratories, the Council of the Association have decided that Wednesday, June 29, shall be an open day for members, when they will be invited to visit the research station.

Appointments

Mr. A. L. Bacharach, M.A. (Cantab.), F.R.I.C., has been appointed chairman of the Food Group of the Society of Chemical Industry for the year 1949-50. Appointment for a second year follows automatically. Mr. Bacharach has been associated with the Food Group since its beginning in 1931; first as an elected member of the Committee then as an *ex officio* member for seven years by virtue of being Honorary Secretary of the Group's Nutrition Panel and for a further four years as its chairman, and last year again as an elected member of the Committee.

*

Mr. R. H. Del Mar, M.A., F.R.I.C., has been appointed managing director of Glycerine, Ltd., and secretary of the United Kingdom Glycerine Producers' Association, in succession to the late Mr. A. Rae. Mr. Del Mar, who is thirty-three years of age, joined the Unilever organisation in 1937; he is managing director of Advita, and is secretary to the Vitamin A Manufacturers' Panel.

Machinery at Belfast Show

A wide range of cranes, petrol and petrol/paraffin engines, woodworking machinery, stainless steel equipment, contractors' plant, and hydraulic presses was shown at the Royal Ulster Agricultural Society Show held at Balmoral, Belfast, on May 25 to 28 by the 600 Group of Companies.

Potato Crisp Machinery

All machinery necessary for manufacturing potato crisps, including potato peelers, "Crispa" machines for making corrugated sliced crisps, 8-gallon crisp driers, two pan crisp frying ranges and steam extractors, heat sealing machines for sealing bags, and heat sealing glassine bags printed in two colours are supplied by the Small Power Machine Co. Their electric crisp drier works on the centrifugal principle; it throws off all surplus water from the cut crisps before frying, thus saving oil. It also prevents crisps from sticking together in the pans, speeds up the frying, obviates the necessity for soaking the crisps in alum, and prevents the splashing of the oil when the crisps are first placed in the pans. The machine can also be supplied with electric heater for economising in oil.

Squirrel Cage Induction Motors

Squirrel cage induction motors of 1½ to 5 h.p. screen protected and drip proof type are described in a leaflet lately issued by Small Electric Motors. Provision is made for air ducts between the shell and stator to assist in cooling the windings, which consist of special heat-resisting synthetic enamel-covered wire protected by means of pliable mica reinforced slot insulation of unusually high dielectric strength. The high conductivity rotor bars are welded to copper end rings by a special automatic process and the rotor assembly complete with fan is dynamically balanced to ensure smooth running. A substantial 4-way entry terminal box with fully detachable lid is mounted on top of the motor body. Six terminals are provided to give facilities for either dual voltage or, above 3 h.p., Star/Delta starting.

British Industries Fair, 1949

SOME FURTHER EXHIBITS

"Packages for most products" was the theme of Reads' exhibition at Earls Court, where a large variety of colour-printed and decorated tins and boxes were displayed. Technical progress was demonstrated by new aluminium drums with welded side-seams, and the provision of reinforcing pressed-out roller hoops on the lighter gauge tinplate drums. Improved plastic-lined drums and a newly designed hoop-closure with extra secure locking device for use on heavy drums were also exhibited.

■

Meters, both single-phase and polyphase, a full range of synchronous time switches, small synchronous motors designed to provide motive power for alternating current timing mechanisms, and a representative range of electrical instruments were exhibited at both the Olympia and Birmingham sections of the British Industries Fair by Sangamo Weston this year. Laboratory standards, portable instruments, panel and switchboard instruments, and photometers and exposure meters were to be seen at their stands.

■

A comprehensive line of instruments for indicating, recording and controlling temperature, pressure, humidity, rate of flow, liquid level, specific gravity, etc., was shown by Short and Mason at the exhibition. Basic instruments exhibited included their "Fulscope" indicating pressure controller, with adjustable sensitivity; their process time controller which incorporates an adjustable timing mechanism which is arranged to come into operation at commencement of process, or when the required operating temperature is reached, and a precise and fully adjustable time cycle controller to regulate the sequence and duration of various operations in industrial processes.

Also included were meteorological and scientific instruments, thermographs, anemometers, hygrometers, industrial, chemical and laboratory thermometers, wind direction and velocity indicators.

Novel packaging and display items shown by William Sessions at Olympia included new-style labels which are self-adhesive and stick instantly with finger-tip pressure on smooth, non-porous, or difficult surfaces. Display stands, containers, showcards, and other selling aids were also on view.

■

Flavouring essences, fruit juices and concentrates, English distilled essential oils, and concentrated and terpeneless essential oils, were included in a comprehensive display at the Earls Court stand of W. J. Bush and Co. Artificial and natural food colours in liquid and powder form which were exhibited included the range of "non-speck" colours especially suitable for custards, blancmange, and pudding powders. A notable part of the exhibit was the display of "Buttabelle" butter flavour, and vanillin made from clove oil. Visitors were given the opportunity of testing flavours used in confectionery prepared in the firm's own experimental confectionery shop.

■

A half-scale working model of one of their three labelling machines was to be seen on the Birmingham stand of Rawsons Labelling Machines. Their "Autorex" standard machine is used for round bottles of all sizes, while the precision model used for pharmaceutical products is especially suitable for labelling on panels and recesses as well as on round and fancy containers. The larger senior precision model fixes large labels on containers of all shapes, including concave; it can be set up for single or double labelling.

Belt conveyors, incorporating an inclined section, cross-over unit and plough, and "straight through" drive unit, working in conjunction with a standard roller conveyor, as well as their recently produced overhead conveyor system were on view at the outdoor stand of Fisher and Ludlow. Another phase of materials handling was demonstrated in a selection of pallets, including flats, post pallets, box and collapsible pallets. Various forms of storage, standard works equipment and examples of fabricated work were also on view, while at their indoor stand the firm exhibited their new range of unit-planned equipment for industrial and canteen use.

New Range of Thermostats

Developed for use where accuracy combined with ease of adjustment is desired, a new thermostat has an adjustable range of 250° C. without resetting, the scale being clearly marked in angular divisions. The applications of this range of thermostats extend from oil and water baths, drying rooms, ovens, and other laboratory purposes, to the industrial field, where they are used for moulding-platens, refrigeration plants, industrial cooking equipment, etc. Sunvic Controls, who have produced this new range, also manufacture electronic relays, resistance-thermometer controllers, evacuated time-delay switches, energy regulators, and other products for the provision of accurate electrical control in many processes.

Forced-draught Coolers

Designed for control of temperature down to 40° F., the Temperatair forced-draught cooler has such uses as an air conditioning unit in food processing and confectionery plants, wine and beer cellars, dough and proof rooms, and in chocolate cooling. Temperature and humidity can be controlled within very close limits, available models ranging from capacities of 10,360 B.T.U.'s per hour to 46,800 B.T.U.'s per hour.

The use of this unit, which is manufactured by King's Refrigeration Supplies Co. (Frig. Spares, Ltd.), prevents waste and provides optimum conditions for storage and manufacture.

Because of its full forward control design, the standard 25 cwt. van has a body capacity of well over 300 cu. ft.

Forward Control Van

Bodywork on modern lines plus all the advantages offered by wide doors of the sliding type make the latest Commer 25 cwt. forward control van a notable advance on its forerunner. Full forward positioning of the driver affords maximum visibility and safety, while greater load capacity—well over 300 cu. ft.—and ease of loading and unloading make it an ideal vehicle for stores whose loads are bulky yet relatively light.

Designed on straightforward lines throughout, the chassis embodies a fully-proved four-cylinder engine developing 40 b.h.p., four-speed gearbox, spiral bevel axle with fully-floating shafts, powerful hydraulic brakes of the two-leading-shoe type, low-pressure tyres, and 112-volt electrical equipment.

Production and Planning Conference

"Production and Planning" was the subject of a recent week-end staff conference held at Bristol University by Boxfoldia. The opening by Miss Beryl Foyle, joint managing director, was followed by a lecture on "The Purposes of Economic Planning," by Mr. H. D. Dickson, M.A. Mr. J. J. Gracie, general manager, G.E.C. Engineering Works, Witton, spoke on "Planning and Industry," while "Planning and People" was dealt with in a talk by Mr. C. A. Lidbury, industrial relations consultant.

Census of Distribution

The census of the distributive and other service trades which is being taken by the Board of Trade in 1951 is in respect of trade in the calendar year 1950, but in those cases where it would be inconvenient for a trader to make such a return because his business year ends on some other date than December 31, 1950, he may complete a return for his business year ending between April 5, 1950, and April 6, 1951.

This means that some traders may find it convenient to base their returns on a business year beginning some time during the year 1949 from April onwards. In order to assist these traders the Board of Trade are making specimen copies of the census forms available in advance to indicate the kind of information that will be required.

Any trader whose business year for the purpose of the census begins during 1949 may therefore obtain a specimen census form by writing to the Board of Trade Census of Distribution Office, Romney House, Tufton Street, London, S.W. 1, giving brief particulars of his business—*i.e.* catering (except residential establishments and public houses), motor trade, pawnbroking, stallholding or street trading, boot and shoe repairing, hairdressing, photography or undertaking, retail shop or wholesale; if his business comes within the last two categories he should also state the kind of trade —*e.g.* grocery, ironmongery, drapery. The number of branches at which the business is carried on and the date on which the business year ends should also be given.

Traders whose business year for the purposes of the census does not begin before January 1, 1950, will be able to obtain specimen forms in the autumn of this year. This will enable a trader whose business year for census purposes will end on December 31, 1950, or between that date and April 6, 1951, to obtain a specimen copy of the form appropriate to his trade before the beginning of his business year.

Trade Protection

All the skill, enterprise, and technical knowledge at their disposal would be needed by traders to cope with the "buyer's market" conditions which are fast approaching, it was stated by L. H. Wright, J.P., C.C., the retiring President, at the annual meeting of the Liverpool Trade Protection Society. In many industries, Mr. Wright said, this "market" had already arrived, and competition was forcing manufacturers to give careful thought to the three essentials of selling—quality, price, and service.

Discrimination had again become necessary and the status of buyers should be tested before credit was given. In this connexion Mr. Wright called attention to the Society's special credit survey service, which comprised a series of special enquiries into the history of the concern under review, its methods of business, past paying records, and present financial position. Transactions which had come under review during the past year involved credit up to as much as a million pounds.

Fruit Juice Development

The first of several products which are to be offered in due course to the public by F.M.S. (Farm Products) is a pure, unfermented apple juice, without extraction or dilution of any kind. This product may be used as an alternative fruit juice to natural orange, pineapple, or tomato, compared with which it is more economical, and is suitable for any purpose where the flavour of fresh apples is desired.

Moulded-to-the-product Pack

Made by a special moulding process which is adaptable to almost any shape and size of product and allows for deep draws and a variety of shapes and contours of greater depth than normally possible, the "Phantom Pack" produced by Hunt Partners provides a protective yet decorative showcase for articles of unusual or awkward shapes. The process involves the drawing or forming of sheet plastic materials; cellulose acetate is the most important raw material used, but most other thermoplastics, including ethylcellulose, vinyl chloride, polyethylene, and methyl methacrylate, are also employed. The high temperature used results in a stable product which keeps its shape. The thickness of the material varies from 0·005 in. to 0·125 in., and 0·3 in. has been used.

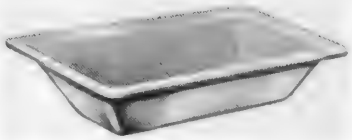
The applications of this moulded-to-the-product pack in the food industry include transparent covers for use in stores, containers, jelly moulds, etc.

New Blender and Disintegrator

Produced in the first place as a laboratory appliance, a new British blender and disintegrator will blend liquids and cut and pulverise a wide variety of solid and semi-solid substances to an extremely fine consistency. For the making of suspensions for analysis, for foodstuff comminution, and for making infusions, the "Ato-Mix," made by Measuring and Scientific Equipment, gives effective results.

The Universal A.C./D.C. motor is fully rubber-mounted and fan-cooled, while the motor bearings are in grease-packed ball-races and are self-lubricating.

The blending and cutting assembly is made from stainless steel. Full speed is 12,000 r.p.m. under load, and a two-way switch permits half speed running if required.



Potted Meat Dish

Light, durable, and virtually unbreakable, a hygienic and attractive dish for potted meat, fish paste, and similar products has recently been introduced. Specially made of an opal plastic material for the potted meat trade, this dish is produced by J. and R. (Butchers') Supplies, who make all types of containers in plastic, stainless steel, and aluminium, and are complete equipment specialists to the food manufacturing trades.

Refrigerants to be made in Britain

The most important of the fluorochloro range of refrigerants, which have hitherto been imported from America under the trade name "Freon," are to be manufactured in this country by Imperial Chemical Industries. The British products, to be known under the trade name "Arcton," are chemically identical with the corresponding "Freons," and will therefore be interchangeable with them.

The refrigerant in this class which will be predominantly used in this country is "Arcton" 6 (the equivalent of "Freon" 12), and in the near future supplies will be made available to meet the full demands of British industry; "Arcton" 9 (the equivalent of "Freon" 11) will also be available in quantity a few months later. A pilot plant is already producing "Arcton" 4 (the equivalent of "Freon" 22) in sufficient quantities to meet existing requirements and small quantities of "Arcton" 7 (the equivalent of "Freon" 21) are also available.

Economic Transport

The economic benefits which trade and industry secured through the use of C-vehicles formed the subject of a recent address to the Western Section of the Institute of Transport at Bristol. A paper entitled "The C Licence—a Justification" was read by Mr. A. G. Yates, of Aplin and Barrett, a member-firm of the Traders' Road Transport Association, the national body for C licence operators.

Mr. Yates explained that cheap transport was not *ipso facto* economic, and detailed other fundamental factors which had to be taken into consideration when determining what form of transport was most economic for any one particular consignment.

Society for General Microbiology

Eighteen original papers and four demonstrations were given at a symposium on "The Nature of the Bacterial Surface" held by the Society for General Microbiology on April 20 and 21.

At the annual general meeting of the Society, the following were elected officers for the coming year:

President: Prof. J. W. McLeod, F.R.S.

Hon. Treasurer: Mr. H. J. Bunker.

Hon. Secretaries: Dr. J. G. Davis (General) and Dr. E. R. van Heyningen (Meetings).

Members of Committee: Dr. L. A. Allen, Dr. C. H. Andrewes, Mr. F. C. Bawden, Dr. S. T. Cowan, Prof. A. W. Downie, Mr. L. D. Galloway, Dr. D. W. Henderson, Dr. R. Lovell, Prof. H. B. Maitland, Dr. P. M. Frances Shattock, Prof. Wilson Smith, and Dr. D. D. Woods, with Sir Alexander Fleming representing the International Association of Microbiologists.

Editorial Board: Dr. B. C. J. G. Knight and Dr. A. A. Miles (Hon. Editors); Dr. G. C. Ainsworth, Prof. W. B. Brierley, Dr. T. Gibson, Dr. A. T. R. Mattick, Dr. K. M. Smith, Dr. A. W. Stableforth, and Dr. D. D. Woods (Associate Editors).

Two-Purpose Food Packs

Bottles made to customer's own design and size, which can subsequently be used as vases, and tumblers in a variety of designs and sizes, used for packing preserves and pickles, are two examples of glass food containers supplied by Jules Lang and Son which provide attractive packs, and in addition have a secondary use as domestic appliances. Butter dishes that make a useful pack for wrapped sweets, and decanters for soft drinks and wines are two equally attractive lines.

Emphasis on First-Class Packaging

MASS PRODUCTION METHODS DISCOUNTED

Members present at the annual dinner of the Institute of Packaging held in London recently heard speakers emphasise the necessity for first-class packaging if British goods are to make headway in export markets.

Proposing the toast of the Institute, Mr. Leslie Gamage, managing director of the General Electric Co., said that despite evidence of recognition of the Institute's usefulness, it was not getting the support it needed if British manufacturers were to become a live factor in the export drive. They would have to sell their goods in an increasingly critical market, and they should not attempt to compete with the U.S.A. by mass-producing consumer goods. The aim should be to get the overseas customer to believe that if he wanted the best he would be safe in buying British. It should be the Institute's purpose, he said, to ensure that the wrappings, packing, and packaging of British goods were worthy of the products inside them. The motto should be "Hats off to the past, but coats off for the future."

Replying, Mr. G. M. Ashwell, President of the Institute, made the suggestion that all trade associations who had a problem in packaging should maintain a small committee concerned with this subject. He stressed that the selection of the correct package was an art, with but few fundamental rules. It depended upon painstaking examination and diligent exploration to arrive at a correct answer.

Mr. H. C. Wild, proposing a toast to the guests, spoke on the need for the proper packaging of foodstuffs. He had heard that, in the city of Cardiff, 40 per cent. of all food poisoning cases could be traced to dirty food—obviously contaminated by lack of proper packaging.

In making his reply to this toast Sir Robert Renwick, late chairman of the London Electric Supply Co., said he hoped that the lessons we had learned in the war in connexion with packaging would be carried on into the future, so that no longer would it be possible for British manufacturers to be criticised by overseas customers for spoiling the product ship for a "ha'p'orth of packaging tar."

Pull-through type cases with divisions, single-faced sleeves, and tray buffers designed for packing eggs and manufactured by The Medway Corrugated Paper Co.

Closures Manufacturers' Assn.

Although there might be a considerable slowing down of business in many directions, Mr. John Ryan, the chairman of the Closures Manufacturers' Association, speaking at the recent annual general meeting, said he thought it would not ultimately affect the trade to more than a marginal degree, and he advised against slaughtering of prices. He felt that manufacturers would have to bring their productions more directly to the notice of the buyers, and he mentioned that there were on foot several plans for exhibitions in this particular field. The main raw material, tinplate, was in short supply and was likely to be reduced still further, but most other commodities used were becoming easier in price and supply.

An account of the work of the Technical Committee, particularly in conjunction with the Glass Federation, was then given by Mr. Huxley, chairman of the committee.

Changes of Address

J. H. Fenner and Co. have removed to larger premises at V-Belt House, 70/74, Union Street, Southwark, London, S.E. 1.

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A new regional office at 33, Knightsbridge, Hyde Park Corner, London, S.W. 1 (Telephone: Sloane 7543 and 4214), has been opened by Greater London Bakeries. All correspondence previously addressed to the company or its executives, Mr. D. Watt and Mr. G. E. Bradfield at Weston Centre, Mr. W. H. de Grey at Surbiton, and Mr. E. B. Bennion at Leytonstone, should now be sent to the new address. For the present correspondence for the managing director should continue to be addressed to 6, North Road, Richmond.

The change of address does not affect Allied Bakeries, Ltd., or any of its subsidiary or associated companies other than Greater London Bakeries and its own subsidiaries.

New Agents Appointed

Padley and Venables have been appointed by Paramount Alloys to be their agents for stainless steel castings in the Birmingham area.

Power Trucks Design Retained

Although no basic change of design on production models is to take place for some months, the design and development departments of Douglas (Kingswood) are being maintained at full strength, and their complete range of power trucks will continue to be distributed in England through the sole concessionaires, George Cohen, Sons and Co.

In addition to the non-elevating models there are high- and low-load elevating types which can be backed up so that the platform runs underneath a pre-loaded still-age and lifts it clear of the ground. The platform is raised by an engine-driven high pressure oil pump, operating through a hydraulic jack, and the control lever is conveniently placed on the steering column. Loads up to 25 cwt. can be picked up in a few seconds.

R.I.C. Annual Report

Important landmarks in the history of the Royal Institute of Chemistry are mentioned in the Report of the Council, 1948, which was submitted at the seventy-first annual general meeting of the Institute. These included the holding of the annual general meeting outside London for the first time, and the publication of the first post-war edition of the *Register of Fellows and Associates*. Two matters of far-reaching importance claimed attention during 1948—approval was given to the terms of a Petition for a new Royal Charter, and of the draft of the proposed Charter, and the annual subscription rates for Fellows and Associates over the age of twenty-five were increased.

In other fields of the Institute's work there has been steady progress. The number of lectures, monographs, and reports published during the year has greatly increased, and a notable increase also took place in the number of meetings held under the auspices of local sections. Important changes were made in the regulations for admission to the Fellowship of the Institute and steps were taken towards organising National Certificates in Chemistry (Northern Ireland) on a basis more comparable with those for England and Wales and for Scotland.

Model of a complete 40-sack flour milling installation to be equipped by Henry Simon for the Companhia Industrial de Portugal e Colonias in Lisbon.

Service to World Industry

The range of engineering and scientific services rendered to world industry by the companies of the Simon Engineering Group was illustrated at a recent exhibition, which comprised photographs and scale models of typical post-war contracts in some forty countries of the world.

The work of the Group as designers, manufacturers, and contractors is concerned with such essential industries as coal, iron and steel, electric power, gas, chemicals, food, and industrial mechanisation in many different forms.

Founded seventy years ago by the late Henry Simon, who built the first complete flour mill on the modern roller system in Britain in 1878 and the first fully automatic flour mill in the world in 1881, the firm of Henry Simon was established to carry on this business. In 1881 he also built the first by-product coke oven plant in Britain, and established the firm of Simon-Carves. Many other engineering specialities have been taken up at various times from 1900 onwards.

The Simon Engineering Group now directly employs about 4,700 people. The head offices and engineering works are at Cheadle Heath, Stockport, Cheshire.

Premier Colloid Mills New Office

A new office has recently been opened in Leeds by Premier Colloid Mills. The address is: c/o Victor Blagden and Co., Ltd., Norwich Union Buildings, City Square, Leeds 1. (Telephone: Leeds 28236.)

Herring Plans Jeopardised

Plans for the fast expansion of quick freezing in the herring industry in Scotland by 1951 are unlikely to materialise if the present situation persists.

Under the existing price structure it is difficult to maintain quick freeze plants in operation for a limited period of each year and to sell the product at an economic level. The distance of the quick freeze plants from the main markets and the fact that there are relatively few other materials which can be utilised to maintain plants in continuous working are main factors in the situation.

It has become necessary to build storage centres or to rent space to hold the products, and in addition difficulties are being experienced in obtaining the required volume of new plant to quick freeze on the large scale which was advocated.

Steel Belt Lacing

For use with all types of light conveyor and flat transmission belts, including leather, balata, canvas, rubber or cotton, the "A Star" flexible belt lacing is made from steel specially produced to give high tensile strength, yet sufficiently ductile to permit breaking off, without distortion, for any width of belt. Made by J. B. Stone and Co., the lacing, which is of the hinge type, is easily fitted by means of a hammer and wooden block. The steel corrugated pins supplied give longer life than twin rocker pins, and have the added advantage that replacements are more easily fitted when pins are worn.

Booklets Received

The publication of the annual report of the Road Haulage Association is a reminder that only a small proportion of the road haulage industry—approximately 20 per cent. of the vehicles and 5 per cent. of the firms—will be nationalised under the Transport Act, 1947. The fairly common assumption that nationalisation of road transport includes all public carriers is completely erroneous. Although in a few months' time certain restrictions may be imposed upon the activities of road hauliers under free enterprise, very few operators are considering leaving the industry. Membership of the R.H.A. now stands at nearly 20,000, including a net increase of 1,200 during the past year, but there are as many firms again still remaining outside the association.

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Continuous progress has been made in the design of impellers to meet the demands of industry for more volume of air from a given size, operation at abnormal temperatures, or the production of extremely high pressure from single stage fans since the time when all centrifugal fans were fitted with simple paddle-bladed impellers running at moderate speeds. A description of some of the latest main types of fans is given in a new booklet published by the Sturtevant Engineering Company.

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Originally intended as an explanation of a gelatine grading system, the booklet *Silver Stream Gelatines* produced by Alfred Adams and Co. is a concise survey on gelatine written in non-scientific language. All stages involved in the production of gelatine, from the raw materials used up to the preparation of powder or kibbled gelatine, are dealt with, together with an account of the grading system, gelatine testing, British Standard methods, and the provisions of the Food and Drugs Act in relation to this product.

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The introductory chapters of *Works Lavatories*, published by the Industrial Welfare Society in co-operation with the Association for Planning and Regional Reconstruction (price 12s. 6d.) include suggestions for improving existing facilities and indicate the possibilities of providing first-class accommodation to those about to build new factories. Two technical sections follow, illustrated by plans and diagrams, together with an alphabetical directory of classified information. An annotated list of some twenty books relevant to the subject and a buyer's guide to British manufacturers and suppliers of equipment, complete the publication.

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In addition to the usual notes on staff activities, the spring issue of *Bamagazine* contains an interesting account from Mr. B. Bregman, technical director, on his recent visit to the company's sites in India and Pakistan.

OBITER DICTA

● Do you mean there is no horse flesh in pies?—*Dr. F. J. O. Coddington.*

● We don't want groundnuts, we want beef.—*Mrs. E. M. Pattullo, President of the Scottish Housewives' Association.*

● The situation is most grave. We will not submit to paralysation or pauperisation.—*Mr. J. I. Partington, President of the National Federation of Meat Traders' Associations.*

● The country wants beef, but the man who produces it has once again been given a smack in the eye.—*Mr. A. W. Garrod of Norfolk N.F.U. on the increased price of sugar beet pulp.*

● I did not know that there were enforcement officers in the Orient, but presumably Turkish Delight is rationed and possibly birds' nest soup is supplied on points. — *Mr. H. Glyn-Jones, K.C.*

● Cheesemaking is no longer the gamble it used to be, and I feel that cheesemaking and pigs remain a very firm plank on which to stand.—*Mr. Paul Goodwin at the 25th annual meeting of the Cheshire Cheese Federation.*

● The finest dumpling apple in the world is the Bramley Seedling. The best Bramley Seedling is the English. England is therefore the source of the best apple dumplings in the world.—*Viscount Bledisloe.*

● In the milk business, as in all other business, too many of us know too many things that can't be done. Then along comes an outsider who doesn't know it can't be done—and he does it.—*"The Milk Dealer," U.S.A.*

● The only way in which fishermen can carry out the Sea Fishing Industry Order properly is to go down in a diving suit and spear the fish, or measure them before they can get into the net. —*Mr. T. Menzies McNeil before Sheriff William Garrett in Edinburgh.*

● Many butchers are dying of broken hearts, not because of the rations or the prices they have to pay, but because it is no longer a pleasure to stand in their shops and serve their customers.—*Councillor H. W. Rywill of the National Federation of Meat Traders' Associations.*

Purchase Tax on Gas Appliances

In the leaflet presenting their case for the removal of purchase tax on gas appliances which was submitted to the Chancellor of the Exchequer by the British Gas Council and endorsed by the Society of British Gas Industries on behalf of the manufacturers of gas appliances, the Council submit that the existing exemption of certain gas appliances from liability should now be extended to the remaining apparatus. In the event of its not being possible thus to remove the tax entirely, it is suggested that the tax should at least (*a*) be removed altogether on water heaters; (*b*) be reduced to one-half (33⅓ per cent.) on space heaters; and (*c*) be removed altogether on lighting fittings, glassware, and mantles.

Experience gained since the purchase tax on fuel appliances was reimposed in April, 1947, and present circumstances, reinforce the views of the British Gas Council that fuel economy is not secured by, and undesirable consequences arise from, the placing of heavy taxation upon appliances which consume fuel in the most efficient and economical manner.

Resignation

At a meeting of the board of G. and J. Weir on April 26 the resignation of Mr. Malcolm L. Jamieson, J.P., from the company on medical advice was accepted with regret.

News from Overseas

Casualty from the Last War

When boning out a rind carcass in an Ulster butchery a butcher's knife rasped on something hidden well inside the carcass. Further inspection disclosed this to be a piece of 3·7 shrapnel which had been embedded six inches.

It is thought that the embedding process took place during anti-aircraft practice when a misfire scattered shrapnel across the fields. The intense heat of the shrapnel during entry had prevented any festering of the wound, which had completely closed.

The shrapnel, which was two inches long by an inch broad, must have been carried by the cow for over two years.

World Medical Council

A council to co-ordinate the holding of medical congresses anywhere in the world has been set up as a result of an international medical conference at Brussels.

Representatives of some forty non-governmental medical groups, many of them of an international character, took part in the sessions, which were under the joint auspices of the World Health Organisation and U.N. Educational, Scientific, and Cultural Organisation.

The main function of the council will be to suggest appropriate places and dates for holding medical congresses throughout the world, so that representatives attending them can save time and money. The council will also study and recommend modern procedures for the conduct of these meetings.

The council will help establish cultural and intellectual understanding by grouping together organisations representing diverse nationalities and political alignments. It also intends to grant subsidies to enable more scientists to attend the congresses. UNESCO and WHO, as well as the non-governmental bodies, will finance the work of the council.

The location of the council will be in Belgium; Dr. Joseph Maisin, director of the Belgian Cancer Institute, was elected chairman of the executive committee.

S. Africa Expects Boom for Home Industries

With the application of import control, coupled with exchange control, processed foodstuffs of all kinds have virtually ceased arriving in the Union, and there can be no doubt that the various food industries in the Union will experience an unprecedented demand for their products.

As far as containers are concerned the Union's glass industries will probably be able to fulfil all requirements. The difficulty will be in respect of tinplate, all of which is at present imported.

Jam and canned preserves produced in the Union have generally been of a high quality, and have held the market for many years against imported products. In spite of considerable developments in the canned fish industry, however, there has always been a preference for the imported article, and it is this group of manufacturers who will no doubt be called upon to meet greater demands than ever. Furthermore, large quantities of canned vegetables and meats of various kinds have always been imported into the Union, which will probably result in new records for sales and output of the local product.

Breakfast Foods in S. Africa

The Kellogg Co. of Canada are establishing a plant in South Africa where some of this firm's products will be made. A factory is being erected at Springs in the Transvaal.

It is understood that the United States firm of General Food Corporation have also concluded arrangements whereby some of their products will be manufactured in South Africa. These arrangements have been made in collaboration with an old-established South African firm.

Malayan Pineapple Exports

A plan has been prepared for the revival of the Malayan pineapple industry, and production is expected to increase to 2 million cases in the next few years.

In a report to the Federal Legislative Council, Mr. C. E. Courtenay, Adviser to the Malayan pineapple industry, stated that a good start had been made with the new planting programme, and progress had also been made in modernising canneries.

The United Kingdom remained the most important outlet for the Malayan pack, but there were also good possibilities of expanding sales to the United States.

Food Hygiene in Ireland

SCHEME TO CONTROL FOOD HANDLING

A new scheme of food hygiene which will regulate the handling and sale of food has been prepared by the Irish Minister for Health.

Under the scheme, premises concerned with the handling of food are to be registered, with power given to the health authority to suspend or cancel the registration in cases where the regulations are not complied with.

Food business employers will be expected to obtain a clean bill of health, so far as scheduled infectious diseases are concerned, from persons entering their employment.

The Minister will have power to suspend a business where a danger exists that food has become so contaminated as to be liable to cause serious illness if consumed.

Records of food business transactions, except in the retail business, will be required to be kept, and health officers will be permitted to take samples of food without payment.

Stringent measures are to be taken in regard to food unfit for human consumption. No prohibited meat will be allowed to be imported into the Republic, and no other meat or meat product will be allowed to be imported unless an official certificate is affixed.

Authorised officers will be empowered to seize contaminated food or food suspected of contamination and have it destroyed.

Dairymen, covered by the Milk and Dairies Act, will be exempt from the regulations.

Metal Box in S. Africa

A new can-making plant has been opened by the Metal Box Co. in Port Elizabeth. While the plant will make a variety of containers, it will primarily serve the interests of the fruit canning factories in the area. Hitherto such factories have had their cans transported by rail from plants about 600 miles away.

American Bundling Machine

Designed to accommodate and package food and other items, a new bundling machine, developed by the American Package Machinery Co., eliminates the need for costly made-to-order cardboard boxes. Shipping costs are also reduced because the paper bundles weigh considerably less than cardboard containers. Moreover, floor space formerly used for storing these latter containers may be utilised in some more profitable manner.

Using strong, tear-resistant Kraft paper, the new bundler, which has an output of twenty-four bundles a minute, fashions tight, firmly-sealed bundles which stand up to handling quite well. Plain or printed wrapping material can be handled, and, if required, preprinted end seals are attached. As the machine can be quickly adjusted packages may be assembled in a variety of wraps. For example, bottles enclosed in cartons can be bundled as efficiently as conventional packages.

New South African Factory

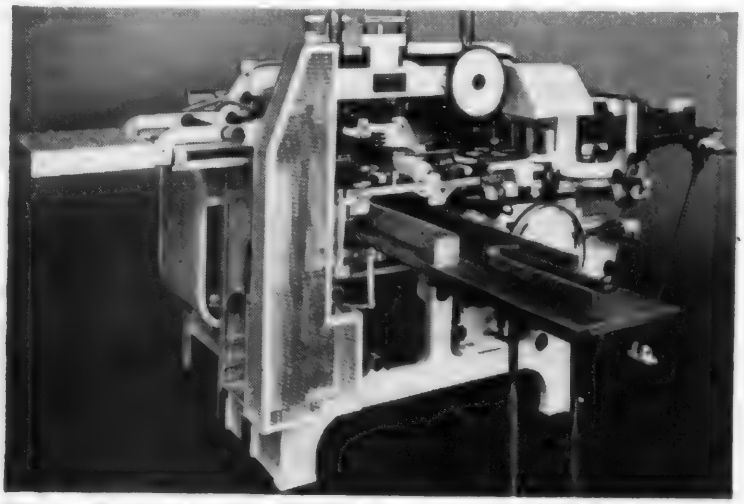
A branch factory at Springs, in the South African Transvaal, has been established by Machonochie Bros., and its locally made products are now being launched on the market.

Food Analysis in Belgium

A collection of notes covering most food products and several associated commodities represents a first attempt to assemble the methods of analysis followed at the *Laboratoire Central du Ministère des Affaires Economiques et des Classes Moyennes*. This volume deals with chemical methods; a second volume, to appear later, will deal with the microbiological and bacteriological methods.

Many of the methods referred to have been made the subject of a thorough examination; in such cases the results of this examination have generally been published, *in extenso*, in some periodical to which reference is made. Other methods have been chosen after an exhaustive examination of the literature at the Laboratory.

The collection is not regarded as either complete or final, but it is believed that it will assist those concerned with the analysis of food products, particularly in industry. It is hoped that this attempt will help in the preparation of a unification of analytical methods of food analysis in Belgium.



The new American bundling machine has an output of twenty-four bundles a minute.

Milk Crumb from Ireland

After a lapse of several months exports of milk crumb from Ireland have been resumed. The crumb is produced at Rathmore Creamery, County Kerry, and is used in the manufacture of milk chocolate.

Nigerian Palm Oil Development

African interest in palm oil press mills in Southern Nigeria is reported by the Colonial Office to be on the increase following the recent installation of six mills of this type in widely separated parts of the colony. This new development in the economic advancement of the palm fruit bearing areas is being closely watched by the Commerce and Industries Department of Nigeria, and further mills are to be established.

The Nigerian Government is planning for these oil mills to be taken over by African companies in due course.

Vegetable Powders in Foods

About twelve years ago Mr. W. J. Abbott, of Mordialloc, Victoria, Australia, began the study of concentrating the Australian brown onion, one of the best keeping and strongest flavoured onions in the world. Previous efforts had been made by others, but the concentrate lost much of its original flavour, and caked when packed in tins. Many years previously Mr. Abbott had produced an excellent concentrated beef in the form of a beef powder. Later he produced a highly concentrated vegetable and beef powder which, after considerable tests, was submitted to the British Ministry of Food by the Australian Commonwealth Government at the outbreak of the war.

Knowing the behaviour of the various vegetables and the causes of spoliation of their natural raw properties during the processing, his research began on producing a high grade quality concentrate that would retain the natural raw appetising properties and produce a perfectly free powder. This was accomplished, and the food manufacturing trade has made use of the onion powder for canning, small goods, and soup powders.

Other products are a garlic powder of very strong flavour, celery, carrot, turnip, and other vegetable powders.

French Cheese Imports Freed

An order allowing the importation without restriction of cheese manufactured in France has been made by the Irish Minister for Agriculture. The prohibition on the importation of other cheese, except under licence, remains in force.

Rhodesia's Development Plan

A ten-year plan for the production of tung oil, tea, coffee, and oil palm has been drawn up by the Northern Rhodesian Agricultural Department. Research will have high priority in the new scheme.

The plan calls for the establishment of five main agricultural research stations whose teams of experts will examine the chemical and physical properties of the various types of soil throughout the territory. Surveys would also include examining the possibilities of growing other oil seeds, jute substitutes, arrowroot, linseed, and pyrethrum. Food crops such as cassavas, new varieties of rice, and the cultivation of citrus and other fruits are also included.

The project includes the improvement of maize and kaffir corn, and research into the possibilities of raising the productivity of poor soil.

A red plastic cap protects the ivory tip from accidental damage.

U.S. Dairy Products in New Containers

Cottage cheese in coloured plastic tumblers is now being marketed by the Bowman Dairy Company, Illinois. When empty, the unbreakable containers can also be used to serve milk.

Another of the company's products is a ready-to-use whipped cream in a convenient container. The finger is pressed against the dispenser tip and a steady flow of whipped cream appears. The containers are air-tight and there is no shrinkage or waste, the cream staying fresh for days in a refrigerator.

Made from fresh Grade A cream to which sugar and vanilla have been added, the cream flows through a pipe line to the filler. After filling, the container moves along the production line, where the valve is pressed into place under hydraulic force preparatory to charging. An ivory plastic tip placed over the metal-rubber valve gives a finished appearance to the container, which is further protected by a red plastic cap.

Sardine Canning in Albania

Albanian authorities are planning the establishment of a sardine canning industry in the country. After a long period of research, sardines have been fished for the first time in Albanian waters.

The State Fishing Enterprise has formed new groups of technicians, who will be engaged in fishing of sardines in Saranda and Shengjwin.

News from the Ministries

Wrapping for Bread

Following the removal of paper control by the Board of Trade, the Minister of Food has decided to lift the restrictions on the sale of machine-wrapped bread and sliced bread from November 1, 1949. There is still a shortage of suitable wrapping material, however, and only a limited quantity of machine-wrapped bread will be available when the ban is lifted.

Price Regulations

The Price Regulation Committees Regulations 1949 came into operation on May 2, 1949. These Regulations consolidate with amendments the provisions of the Price Regulations Committees Regulations 1941 (S.R. & O. 1941 No. 1978) as amended.

The provisions governing the making and handling of complaints, the giving of notices of allegation, and the appearance of alleged offenders before committees have been revised in a number of minor respects, the minimum number of members of Local Committees has been reduced from nine to seven, and the particulars of the committees contained in the Schedule have been brought up to date.

Jam and Canned Fruit Prices Reduced

As a result of a reduction in purchase prices, the maximum selling prices of some imported jams and marmalade and of all imported canned fruit, except mandarins, oranges, and apples, were reduced as from April 10, 1949. The maximum prices of strawberry jam manufactured in the United Kingdom, which is the dearest of the home-produced jams, were also reduced from the same date.

Private Food Imports

Attention has been drawn to circulars sent from overseas to addresses in the United Kingdom offering food for sale.

Members of the public are warned that it is, in general, an offence against Board of Trade regulations to import without a licence goods purchased abroad, whether from the sterling area or not, and that anyone importing rationed foods in this way would also be offending against the Food Rationing Orders. This means also that anyone who buys rationed foods from any country overseas, including the Republic of Ireland, in response to circulars offering foods for sale, makes himself liable to prosecution.

Import licences are not normally granted for private purchases, and goods purchased from abroad without a licence are liable to confiscation.

Meat Supplies from Australia

PROMOTION OF DEVELOPMENT SCHEMES

During the course of his recent visit to London, Mr. Chifley has been able to discuss with Mr. Strachey plans for the increase of meat supplies to the United Kingdom from Australia.

Extensive preparatory work has been done in Australia. Plans have been worked out and the necessary capital expenditure approved by the Commonwealth Government for increased cattle production in the Wyndham area of the State of Western Australia. Projects for the expansion of production in big areas in Northern Australia — involving road making, stock route improvements, schemes for water conservation and the like—are also being investigated. Schemes for development in other parts of Australia are to be considered. It is recognised that these developments will require substantial supplies of materials, particularly steel products, and road-making equipment beyond those available in Australia itself.

In view of the importance to the United Kingdom of increased meat supplies from Australia the Government of the United Kingdom has urged the Commonwealth Government to promote development schemes designed substantially to raise exports to the United Kingdom to an agreed level within an agreed period.

The Government of the United Kingdom has declared its willingness, in return for an undertaking on the part of the Australian Government to promote development schemes which offer a good prospect of increased supplies of the agreed magnitude, to enter into arrangements that will guarantee a market at reasonable prices in the United Kingdom for the whole of the exportable surplus of meat from Australia up to a specified ceiling during a period of fifteen years. The Government of the United Kingdom is also prepared to set limits upon the fluctuation of prices during a period of seven years, as in the case of the contracts for butter and cheese with Australia.

Chocolate and Sweets Order

A new Chocolate, Sugar Confectionery and Cocoa Products Order, which came into force on April 24, supersedes the existing Chocolate, Sugar Confectionery and Cocoa Products (Control and Maximum Prices) Order, 1944, as amended.

One of the principal changes is that medicated chocolate and sugar confectionery are brought within the scope of the Order except for products which:

(*a*) comply with recognised medical formulae;

(*b*) consist of compressed tablets containing a specified amount of any one or more of three specified drugs;

(*c*) are specifically exempted by Ministry authorisation. Such authorisations will be issued in all cases where the Ministry is already satisfied that the products' medicinal properties entitle them to be manufactured free of the provisions of the Order. In any other cases where manufacturers consider that their medicated products should be exempted from the provisions of the Order, application should be made to the Chocolate and Sugar Confectionery Division, London Road, Stanmore, Middlesex.

South Africa Liquor Imports

Under the terms of the Gold Loan agreement between the Union of South Africa and the United Kingdom, provision has been made for the importation into the United Kingdom during 1949 of wines, spirits, and liqueurs to the total sterling value of £1,460,000 f.o.b. (excluding high strength spirit). Shipments arriving up to March 31, 1950, will include beverage wines, fortified wines, sparkling wines, Vermouth, liqueur, Van de Hum, brandy, grape syrup, and sacrament wines.

Supplies will not be subject to any form of price control, nor will distribution be controlled except in the case of brandy which will continue to be apportioned on an arranged basis as in the past. Licensing will be dealt with on the same lines as in previous concessions.

The licensing of additional imports to replace losses in transit will not be considered. Shipments intended for re-export, ships' stores, sacramental wines, base wines for further processing, and supplies to the Channel Islands must be counted against allocations. No additional import licences will be issued for such shipments.

Trade enquiries should be addressed to the Senior Trade Commissioner, Union of South Africa, South Africa House, Trafalgar Square, London, W.C. 2.

Coffee Essence and Extract

Because supplies are now plentiful, the Coffee Essence Control Order, 1942, has been further amended to release all types of liquid coffee essence and liquid coffee and chicory essence from price and other controls from April 24, 1949. The manufacture and sale of dry coffee extract continues to be subject to statutory control.

Table Jellies

Article 3 of the Table Jellies (Maximum Prices) Order, 1946, which concerns proceedings in connexion with alleged deficiencies of weight, has been revoked by the Minister of Food. In future such deficiencies will be dealt with under Article 8 of the Labelling of Food Order, 1946, which applies to all pre-packed foods. The revocation came into effect on April 18.

Imports from Holland

In agreement with the Board of Trade, the Ministry of Food announces that arrangements have been made, as a result of the recent Anglo-Dutch trade talks, for limited quantities of prepacked chocolate spread, sweetened dessert powder, pastry mix, and sweetened fat to be imported from Holland during 1949 under specific licence.

Each application for an import licence must be accompanied by a copy of the relative export licence obtained from the Dutch exporter and should be submitted in duplicate on Form ILD/A to the Board of Trade, 189, Regent Street, W. 1. For administrative convenience, the applications should be sent via the Ministry of Food, Miscellaneous Food Products Division, 15, Portman Square, W. 1. Copies of the application form may be obtained from the Board of Trade or from any Customs Office.

Information and Advice

Bread Baking Tins

B.3351. *We shall be pleased to know the best shape of tin for making commercial bread under present trade conditions. A 2 lb. tin does not give the best volume and appearance to the 1¾ lb. loaf and we would appreciate any details as to the suggested dimensions for a 1¾ lb. loaf.* (Lancs.)

Loaves baked in similar tins in different bakeries can vary appreciably in volume and quality, and there is considerable variation even in loaves baked in the same bakery in similar type tins.

The effect of difference in volume of loaves baked in various shaped tins cannot affect consumer preference very markedly, as it is understood that in the case of a baker using as many as five different shapes there is no difficulty in selling any one type.

Excellent quality 1¾ lb. loaves can be baked in tins of the following dimensions:

Internal base, 4 in. × 7¼ in. approx.
Internal top, 4¾ in. × 8¼ in. approx.
Depth, 3¾ in.

Satisfactory results can be obtained using the longer type tin, *e.g.* 11 in. × 4¼ in. base, straight sides, and 3 in. deep approximately.

Blackcurrant Jam

B.3350. *Can you suggest any method of preventing toughening of blackcurrants in jam in which 38 to 42 per cent. fruit is used? Is there any objection to using as much as 4 to 5 oz. of trisodium citrate per pan of blackcurrant jam for the purpose of keeping down inversion?* (Eire.)

We advise the following procedure for preventing toughening of blackcurrants in jam. The pans should be charged with blackcurrant pulp, together with approximately 25 to 35 lb. water per batch. The water should be reasonably soft, otherwise it is necessary to add a small amount of bicarbonate of soda. The blackcurrant pulp is boiled until completely tender, the sugar is then added and the boil completed. If this procedure is followed, and a sugar syrup of not less than 180° F. is added, the boiling time could be easily cut to a minimum and the final inversion figure reduced. It is essential that the pans should be emptied immediately after the boil is finished; in the absence of a cooling plant we suggest that the batches are split and each is discharged into a receptacle and stirred briskly until the temperature is around 160° F.

Taking an average soluble solid figure of 70 per cent. as a basis, the invert sugar percentage should not exceed 32 per cent.

With regard to the use of alkaline buffers in connexion with the boiling of blackcurrant and loganberry varieties this is widely practised and technically there is no objection if they are used within reason. The quantity to be used is entirely dependent on the acid content and the *p*H value of the fruit. In our opinion, however, the practice should be discouraged as alkaline buffers destroy ascorbic acid and are not pleasing to the palate.

Information Supplied

B.3318. *Suppliers of literature on the frozen beef industry.* (Portugal.)

B.3319. *Suppliers of dried baking yeast.* (London.)

B.3325. *Suppliers of small continuous frying equipment for potato crisps.* (Yorks.)

B.3334. *Manufacturers of vacuum can closing machines.* (Ireland.)

B.3345. *Manufacturers of a press for cocoa.* (Italy.)

B.3347. *Manufacturers of mineral licks for cattle.* (Lincs.)

B.3348. *Manufacturers of bottle washers and suppliers of adhesives.* (Yorks.)

B.3349. *Manufacturers of can-making machinery.* (Lancs.)

B.3356. *Manufacturers of vitamin oil concentrates.* (Jamaica.)

B.3357. *Suppliers of drain taps suitable for use with SO_2.* (Lincs.)

B.3358. *Suppliers of plant for candying peel.* (Jamaica.)

B.3359. *Manufacturers of paste flour.* (London.)

B.3361. *Suppliers of artificial colouring for green peas.* (London.)

B.3362. *Suppliers of a non-ionic wetting agent.* (London.)

B.3367. *Manufacturers of Butt taps.* (Lancs.)

B.3369. *Suppliers of showcard stamping equipment.* (Ireland.)

B.3370. *Manufacturers engaged in extracting oil from almonds.* (London.)

B.3371. *Manufacturers of monosodium glutamate.* (London.)

B.3372. *Manufacturers of a rotary piston filler.* (New Zealand.)

B.3375. *Suppliers of plant for peeling green ginger.* (New Zealand.)

B.3376. *Suppliers of tins for canning peas and beans.* (Ireland.)

B.3395. *Suppliers of glusidum and locust bean sugar extract.* (Surrey.)

B.3400. *Suppliers of equipment for the manufacture of popcorn.* (Northumberland.)

B.3401. *Suppliers of locust bean powder.* (Ireland.)

B.3402. *Suppliers of lecithin for chocolate manufacture.* (Ireland.)

B.3403. *Suppliers of whey powder and egg albumen.* (N. Ireland.)

Information Required

B.3385. *Manufacturers of St. John's bread flour.* (London.)

B.3425. *Manufacturers of a product known as Caffogene 47.* (Lancs.)

B.3448. *Suppliers of therm-index paints and Temple sticks or heat indicating crayons.* (Essex.)

Recent Patents

These particulars of new patents of interest to readers have been selected from the "Official Journal of Patents," and are published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. 6d. weekly (annual subscription £3 15s.).

Specifications Published

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 2s. each.

616,789. WATERS, H. F.: Preservation and packaging of food.

616,790. USINES DE MELLE: Pyroligneous liquors for preserving food products and methods of preparing the same.

616,792. SCHRODER, W. L., and ROGERS, E. H.: Method of preparing green vegetables for canning.

616,833. BELCHER, A. G. W., and TILL, W. J.: Apparatus for peeling and/or washing or dressing potatoes and other vegetables and fruits, adaptable also for other purposes.

617,137. IMPERIAL CHEMICAL INDUSTRIES, LTD., CROOKS, D. A., and SCOTT, T. R.: Manufacture of common salt from brine.

617,264. ETABLISSEMENTS SIMON FRÈRES: Machine for moulding and wrapping blocks of butter, margarine, or other products of similar consistency.

617,455. GREAVES, R., and GREAVES, B. B.: Pneumatic sack cleaning apparatus.

617,493. JENNINGS, H. W. K. (American Dairies, Inc., and Quaker Oats Co.): Dehydrating methods and apparatus.

Abstract of a Recent Specification

Dehydrating Vegetable Food Products

This invention relates to a method of producing vegetable food products in dehydrated block form. The term "vegetable food" as used herein covers the edible portions of vegetable or fruit matter and "vegetable food product" covers vegetable food either raw, partly cooked, cooked or prepared for consumption in any manner.

One object of the invention is to provide an improved method of dehydratting such vegetable food products which results in a greater degree of desiccation than has heretofore been accomplished.

Another object of the invention is the production of a compressed block or briquette of dehydrated vegetable food product of such density as to be substantially non-hygroscopic under proper storage conditions while soluble to the degree required for convenient use.

A further object of the invention is the conversion of vegetable food products into a form which permits storage and transportation over long periods of time without spoilage or deterioration and which may be subsequently converted into an appetising and palatable form while retaining its vitamins and other nutritional constituents.

The invention consists in a method of dehydrating a compressed block of partially dried vegetable food product which comprises subjecting the block to high frequency dielectric heating within a vacuum.

Re-entrance of moisture during storage is prevented by the conventional use of air-tight enclosures of paper, metal, or other impervious material.

In putting the method into practice, the vegetable food product may be in shredded or flaked form, having been partially dried, by exposure to a dry atmosphere with or without the application of sufficient heat to cause evaporation of the moisture from the surface of the material, and then compressed into blocks or briquettes under such pressure that the moisture content of the substance is materially reduced and its density increased. The density should not, however, be made so great that the moisture in the interior of the block is unable to evaporate and escape when the block is subjected subsequently to high frequency heating.

606,882. *Standard Telephones and Cables, Ltd.*

Trade Marks

The list of trade marks of interest to readers has been selected from the "Official Trade Marks Journal" and is published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

HAPPY COOKIE.—663,186. Edible oils and edible fats. **Towers Creameries, Limited,** Towers Factory, Commonside East, Mitcham, Surrey; Manufacturers and Merchants.

EXTEX.—664,175. Emulsifying agents, being chemical substances for use in the manufacture of food products. **M.R. Chemical Products, Limited,** Northgate House, 20-22, Moorgate, City of London; Manufacturers and Merchants.

DIMITY.—664,178. Non-medicated confectionery. **Lloyd Owen (Overseas), Limited,** 2, Broad Street Place, London, E.C.2; Manufacturers.

BURLA.—665,042. Cereals prepared for food for human use. **Cereal Food Manufacturers of Great Britain, Limited,** Bannerbrook Mills, New Dock, Llanelly, Wales; Manufacturers.

BRIGHT STREAM.—665,133. Canned fish. **A. J. Mills and Company, Limited,** Colonial House, Tooley Street, London, S.E.1; Manufacturers.

CHIPITES.—665,625. Chocolate and chocolate confectionery, none being medicated. **W. S. Shuttleworth and Company, Limited,** Spa Works, Galleywall Road, London, S.E.16; Chocolate Manufacturers.

New Companies

Phillips and Lyle, Limited. (463141.) 59, Church Road, Burgess Hill, Sussex. To carry on business of bakers and confectioners, etc. Nom. cap.: £15,000 in £1 shares (7,500 pref.). Dirs.: To be appointed by subs. Subs.: A. N. Lyle, 23, Park Road, Burgess Hill, Sussex; E. J. Lamble, 26, Edward Road, Haywards Heath, Sussex (secy.).

Wold Fisheries (Lincs.), Limited. (463158.) 108, Cromwell Road, Grimsby. To carry on business of fish friers, merchants, etc. Nom. cap.: £2,000 in £1 shares. Dirs.: E. J. Ranby, Grimblethorpe Hall, Louth; D. H. Kellaway, Stensgot Hall, Louth; S. Blackbourn and H. K. Green.

Jolly Miller Bakeries, Limited. (463180.) 48, Dundas Street, Sunderland. Nom. cap.: £1,000 in £1 shares. Dirs.: J. Stephenson, Redhill, Whitburn, Sunderland; N. Atkinson, address not stated.

K.K. (Edible Oils), Limited. (463183.) 39A, Woodgrange Road, Forest Gate, E.7. To carry on business of retail horseflesh merchants for human consumption and animal feeding; manufacturers and processors of edible oils, etc. Nom. cap.: £100 in £1 shares. Permt. dirs.: K. Klein and M. I. Klein, 31, South Park Road, Ilford.

Crispa Crisp Company, Limited. (463692.) 30, Brown Street, Manchester, 2. To carry on business of manufacturers of and dealers in potato crisps, etc. Nom. cap.: £500 in £1 shares. Dirs.: R. D. Smith, 202, Bridgeman Street, Bolton; J. Burnside, 85, Beresford Road, Levenshulme, Manchester; R. Leeming, 340, Slade Lane, Levenshulme, Manchester.

Taken from the Daily Register, compiled by Jordan and Sons, Limited, Company Registration Agents, 116, Chancery Lane, London, W.C. 2.